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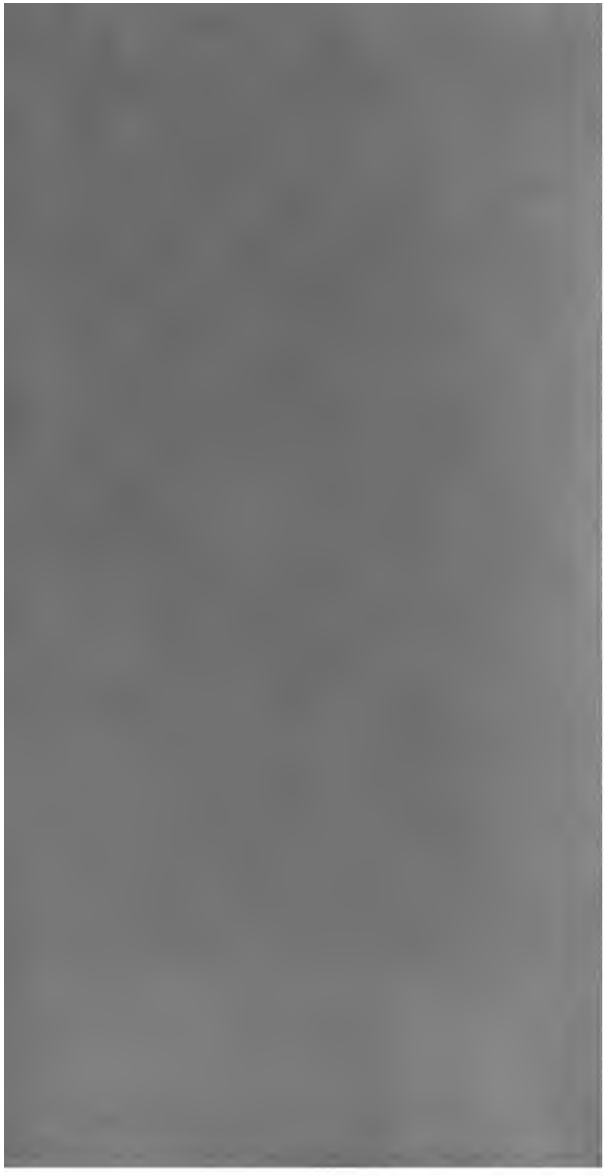

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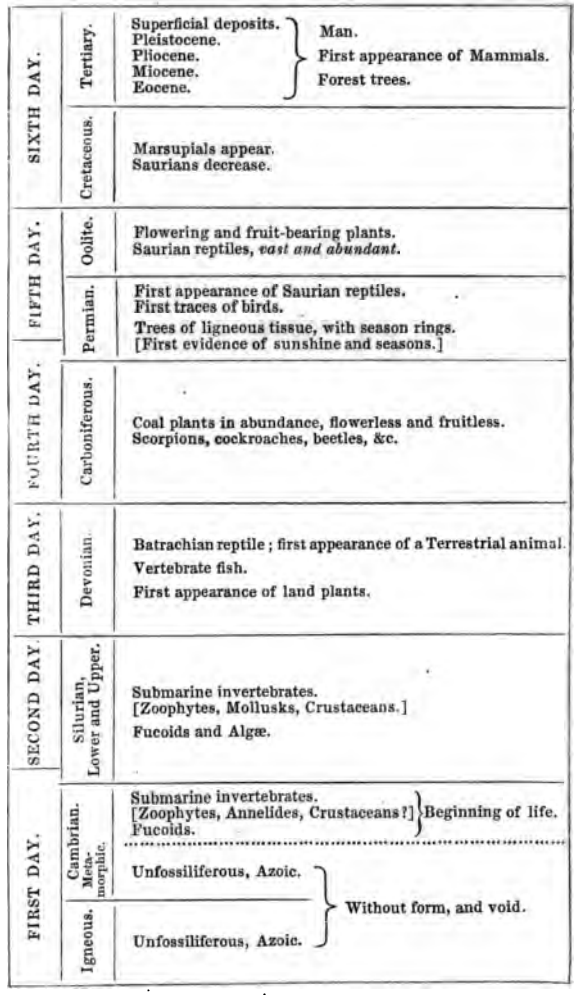

TRANSFER FROM LENOX.

SERMONS IN STONES;

OR,

SCRIPTURE

CONFIRMED BY GEOLOGY.

BY

DOMINICK M^c^ CAUSLAND, ESQ.

BARRISTER-AT-LAW,

THE AUTHOR OF "THE TIMES OF THE GENTILES," ETC.

FIFTH EDITION.

"TEACH ME, BY THIS STUPENDOUS SCAFFOLDING,
CREATION'S GOLDEN STEPS, TO CLIMB TO THEE."

LONDON:
RICHARD BENTLEY, NEW BURLINGTON STREET,
Publisher in Ordinary to Her Majesty.
1858.

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.
1901

PREFACE TO THE FOURTH EDITION.

THE increase of Geological facts since the publication of this work, and the consequent advance of Geological Science, have rendered it necessary to make some additions to the text of this Edition. But the arguments and reasoning by which Geology and the Scripture record of the Creation are harmonized remain without any material variation.

Geology is a rapidly progressive science; and every day is adding to the perfection of its details. But some of its leading principles and propositions, forming the links which unite the two records of Nature and Revelation, may now be considered as established beyond question and the probability of change. Thus, the gradual progress of Creation

from the lower to the higher orders of living organisms—from the simply constructed Zoophyte, through the intermediate classes of the invertebrate Mollusks, Crustaceans, vertebrate Fishes, Reptiles and Mammals, up to Man—which will be found to be the order of the Genesis of animal life recorded by Moses, is now so well settled by a long series of well-authenticated observations, that there is no ground for apprehension that there will be any displacement of that established law of creation: and from past experience it may be safely inferred, that every new fact will tend to confirm and illustrate it. The increase of knowledge in this direction will, therefore, be an increase of the evidence of Scripture inspiration, and the study of this much-slandered science will, in addition to its other practical advantages, be the promotion of truth in its best and most important sense. A right apprehension of facts, and of their relation to each other, is always of value to mankind; but how is that value increased, when such knowledge leads us onward beyond the things of time to those of eternity!

It has been well observed, "that the Religionist has nothing to fear, and the Infidel nothing to hope for, from the truths of Geology." These pages were written for the purpose of upholding and expanding this proposition: and the favourable reception which has been accorded to them by the public, encourages the hope that the day is past, when the study of the structure of our planet, and the investigation of the laws which the Creator has imposed upon Himself in the process of furnishing it with organic life, were decried and discouraged by well-meaning, but short-sighted advocates of the inspiration and integrity of the Scriptures; and the intelligent Religionist, who reads the Book of Nature, is no longer driven to reject and deny the facts of the Philosopher, through a misapprehension that inconsistencies will be found between the words and the works of the Almighty—while the Philosopher need no longer labour under the imputation, and perhaps an impression on his own mind, that his paths of inquiry are leading him away from the strongholds of Revelation. Let us hope that henceforth they may be found fellow-

workers together in the development of the great truth, that a Divine communication from God to Man of the order of the creation of the world and its inhabitants, is as well authenticated as the fact of the Creation itself by his Almighty power.

D. M^{c} C.

DUBLIN,
April 10, 1858.

PREFACE TO THE FIRST EDITION.

Is the Mosaic narrative of the Creation reconcilable with the established facts of Geology, or is it a true and authentic record of a series of events which occurred on our planet previous to the existence of the human race? These are questions of vital importance to all who rely on the inspiration of Holy Writ, and profess to have an interest in the precepts and promises which it contains: and yet, it must be admitted, that they have never hitherto been satisfactorily answered. To confirm this statement, it will be sufficient to mention the fact, that the Rev. Baden Powell, the Savilian Professor of Oxford, and an Author of some note, has, in a recent work, entitled "The Unity of Worlds," assumed it to be a fact not to be questioned by Religionist or Philosopher, that the discrepancies are not merely irreconcilable, but that there is a "*palpable contradiction*" between the facts of Geology and the Bible record of the Creation. It is seldom that opinions and prin-

ciples so subversive of the whole structure of revealed truth, are propounded with so little reserve. Nevertheless, they are the opinions and principles of many who have given attention to the subject, and profess at the same time, somewhat inconsistently, to believe in the divine inspiration of Scripture.

It ought not, therefore, to be matter of surprise, that the pursuits and inquiries of the Geologist should have been frequently regarded with distrust and aversion by the Christian believer; and that, on the other hand, many of those who are well versed in the knowledge of Geological facts, should have entertained misgivings as to the accuracy of the Mosaic Record. Such feelings could only have originated in a crude and imperfect knowledge of the truths of Science, on the one side, and in erroneous impressions of the meaning of the Scripture text on the other: for, if the writer of Genesis has not been deceiving himself and others, and if the philosopher who has been labouring in the compilation of the facts of Geology, has not approached his fellow-man wit' a lie in his right hand, the Record of the Bib and the Record of the Geologist must harmoni in every particular. However great and di cordant their discrepancies may appear, th' cannot be insuperable, and the difficulties r

admit of a solution; for there can be no inconsistency between the Word and the Works of the Almighty.

To develop this harmony, and to demonstrate the correspondence of the items which are shown by Geology to have composed the vast chain of being, and the order of their appearance on the stage of existence, from the beginning of light and life to the birth of Adam, with the catalogue of the Creation in Genesis—and thereby to establish the divine inspiration of the Bible by evidence that can be seen and handled, is the object of the following pages. The stony tables of Nature, interpreted and explained by the Geologist, will be found to supply the testimony that the pen of Moses was guided and directed by the hand of the Most High, in tracing the imposing description of the scenes of the pre-Adamite world, which meets us at the threshold "of those things which have been revealed."

In exploring this interesting and instructive field of inquiry, the Author has been careful to enter upon no path which has not been developed and sanctioned by the highest authorities in those departments of physical science which it has been necessary to consult: and the Reader will not find himself called upon to yield assent to any fact which does not admit of sensible or scientific

demonstration, or to accept of any reading of the text of Scripture which will not bear the test of the closest critical examination. By such means alone is truth to be detected and perpetuated; for to speculate and theorize on such subjects, is to follow after seductive and treacherous phantoms, that have seldom failed to involve those who pursue them in pernicious and fatal error.

The Author is sensible that where so many of high talent and deep research have failed to identify the Record of Nature with the Record of Moses, a prejudice must prevail to induce the majority of Readers to distrust *any elucidation* of the subject, and, without considering the consequences, to acquiesce in the hasty and dogmatic assertion of the Author of "The Unity of Worlds," that they are wholly at variance. But it ought to be borne in mind, that the Science of Geology is of recent birth, and unexampled in the rapidity of its growth—so that, as a collection of facts, it must have presented, even within a short period of time, a very different aspect to the student from that which it now presents, when all its members have been defined and arranged, with astonishing accuracy, by the zeal and energy of its professors. Truth has been struggling out of darkness into light; and, with the aid of inductive philosophy, she has gradually emerged from the

mists of theory and conjecture, until her fair proportions stand revealed to the ordinary observer: and thus it is, that the several phases which our planet and its inhabitants have presented at the successive stages of its existence hitherto observed, are now so clearly delineated, that he who has a correct knowledge of the meaning of the Scripture text, can scarcely fail to realize in the teachings of the Geologist, the scenes which have been depicted by the divine historian in the graphic opening episode of the Bible.

Let the Reader go forth, and devote a few of his leisure moments to the inquiry if these things are so, and these pages shall not have been written in vain. Such knowledge is not too high for him; and time and opportunity will not be wanting, even to those occupied in the most exacting professional and worldly pursuits,

> "To read creation; read the mighty plan
> In the bare bosom of the Deity."

The Bible is in his hand; and the Book of Nature lies open before him, with the light of Science shining down upon it. Hill and Vale—Rock and Tree—Ocean and Stream present themselves on all sides, with their contents, as witnesses that the words of Moses are the unimpeachable record of the counsels of old of the Most High, when

his fingers were fashioning the foundations of the world. Let him apply his personal observation to the comparison of the description with the things described; and he will thus enlarge the boundaries of his knowledge in a direction which must tend to quicken and consolidate his religious impressions and convictions, and relieve his mind from many of those anxious doubts and fears, which haunt and harass the soul of man, and perplex and sadden the path of his existence.

"The man who consecrates his hours
By vigorous effort, and an honest aim,
At once he draws the sting of life and death—
He walks with Nature, and her paths are peace."

D. M° C.

DUBLIN, *January* 1, 1856.

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CHAPTER I.

THE TWO RECORDS OF THE CREATION.

"Read Nature: Nature is the friend of Truth."—YOUNG.

IN the beginning God made the earth and all that therein is—not by the exercise of a single act of creative power, but by a series of such acts, and according to a certain system or order of progression. It is thus written in the first page of the Bible; and the Record is believed by the great body of Christians, merely because it is so written. Some, however, in a sceptical, or, it may be, a more inquiring spirit, seek for a confirmation of the authenticity, authority, and inspiration of the sacred narrative; and if what is there recorded admits of confirmation, the believer in its divine origin cannot resist the demand that there should be some proof given of the Record being consistent with what sense and experience teaches us of the origin and order of the creation. For upwards of 3000 years after its publication, man was without the means of testing the accuracy of the divine

penman: but the progress of observation and science has gradually enlarged the sphere of his knowledge, and furnished him with the means of perusing the early history of our planet, and of ascertaining, with some accuracy, the order of the appearance of the animal and vegetable existences with which it has, from time to time, been furnished. This knowledge has been imparted principally through the medium of the science of Geology, which exhibits to our view what the author of Genesis has described of the pre-Adamite world in the opening scene of the Bible.

Though frequent allusions to geological phenomena are to be found in the writings of philosophers and poets of antiquity, it is only within the last half century that Geology has been admitted into the rank of the sciences, and established as such on the firm basis of legitimate induction. But though it is the youngest born of the physical sciences, yet in the magnitude and sublimity of the objects of its fascinating researches, its practical utility, and the extent and importance of its religious applications, it is second to none. Hence it is, that the study of Geology has attracted and engaged the attention of the most inquiring and best informed of our philosophers; who, from its collected and classified discoveries, have already compiled an authentic history of the world and its occupants, during the countless ages which have intervened between its creation and the creation of man—a history which rests on surer founda-

tions than the records of any portion or period of the world since the human race came into existence. In this Record we have presented to our view, the various races of the animal and vegetable creation, which have successively occupied the surface of the globe, from the time that the spirit of God first moved on the face of the deep, until He breathed the breath of life into the nostrils of the first man, and the many changes of condition and vicissitudes which our planet has witnessed throughout the long periods of its preparation for his reception.

It is from the rocks which compose the crust of the earth on which we tread, that this information has been derived. In the fossil remains with which they are charged, we behold the very creatures as they existed, in some instances, converted into silex, limestone, or quartz, according to the character of the substance in which they were imbedded, without the slightest alteration in form; in others, we have the lineaments of the animal or plant portrayed with the utmost accuracy, and preserved in the hardened rock. At the bidding of the geologist, the earth gives up the rigid forms of her early-born and long-buried offspring, to testify from their stony sepulchres to her present occupants, of the wisdom and omnipotence of the Creator, at periods when no human mind was in existence to comprehend and appreciate them. From the foot-prints, also, and other traces of the then existing animals, which were

impressed upon the soft mud or sand, but now hardened into stone, the forms and dimensions of the creature can be in a great measure ascertained; and, with the assistance of the comparative anatomist, they have been, in many instances, reconstructed—so that, though every particle of the matter of which the frame was once composed has vanished, the creature, as it lived and moved, may still be presented to our wondering view, and enlarge our knowledge of the state and economies of nature at the time of its existence.

These are the principal materials from which geologists have compiled for us the history of this period of our planet's existence. The evidence is derived from the testimony of the senses, and is therefore demonstrative in its nature; and, for the most part, so sure and unerring are the conclusions, that they defy contradiction, and preclude misconstruction.

But, as we have already stated, there is another Record of events which occurred during some portion, at all events, of the same primeval period, traced by the hand of a man, though, as believers maintain, dictated by the Spirit of God. We mean the Mosaic Record of the Creation. If it be true that this Record was a revelation from the Almighty, it cannot err: and there can be no inconsistency, much less contradiction, between it and the stony legend of the geologist. Whatever has been written under the divine inspiration cannot be inconsistent with anything created by

the divine hand. God is truth; and his word cannot be refuted by his works. Nor ought any believer to rest satisfied until the authenticity of the written history shall have been vindicated and established beyond cavil and dispute. The first page of his charter and title to life and immortality must be not only clear from imputation, but confirmed and corroborated in every particular; and geology, as a collection of well-ascertained facts, must be recognised and welcomed as the heaven-sent test of the truth and inspiration of the Mosaic narrative. There is nothing to be apprehended from that or any other science, when its facts and principles are clearly discerned and settled. "Science has ever been, and ever must be, the safeguard of religion; the grandeur of its truths may transcend our failing reason, but those who cherish and lean on truths equally grand, but certainly more incomprehensible, ought to see in the marvels of the natural world the best defences and illustrations of the mysteries of their faith." [1]

To reconcile the Bible history of the pre-Adamite world with the facts of geology by showing that both may be true, and that there is *no contradiction* between them, is a work which has occupied the attention of many excellent and able Christians, and is, no doubt, one which has been of assistance to the cause of truth; but to call in aid those facts to establish and prove the

[1] More Worlds than One, p. 196.

inspiration of the sacred historian, is a work of much higher import and utility in the believer's warfare with the sceptic and infidel. But in no such spirit has geology been yet received. When it first began to assume the form of a science—when its facts were in progress of collection and classification, it was rumoured and insinuated, and afterwards openly asserted and proclaimed by the sceptic, that the Record of Moses was about to be falsified by the evidence of the senses. The inquiries of the geologist were therefore, at first, viewed with suspicion and distrust, and then, without examination, rejected and denounced by the great body of Christians, who had neither time nor opportunity to ascertain facts, and draw conclusions from them for the satisfaction of their scruples, or the confirmation of their convictions. Nor is it to be denied, but that the writings and speculations of some able geologists afforded grounds for the misapprehensions and prejudices which have prevailed on the subject. Still there were some few men of intelligence and piety, who, firm in their assurance of the divine origin of the Scriptures, hesitated not to grapple with the supposed enemy; and who from time to time endeavoured to convince the world that Scripture could be reconciled with geology—that both might be true; but none of them appear to have gone so far as to summon forth the new-born science as a witness to the truth of the Bible narrative in its simple and obvious meaning, and to set it

up as the mainstay and supporter of the Revelation which we hope to prove it to be in the following pages.

Dr. Thomas Chalmers, the celebrated Scotch divine, was the foremost of these champions of Bible inspiration. He was followed by several others of great ability, and well versed in scriptural, philological, and scientific knowledge. The construction which they suggested for the vindication of Scripture we shall notice hereafter more particularly. At present we need only observe that, admitting the certainty of the language of the Bible, and conceding the facts of geology, they contended that the narrative of Moses was not a narrative of the events which occurred from "the beginning," when the heavens and the earth were launched by the hand of the Creator from non-existence into being, down to the creation of man, but only of certain events which occupied the period of the six natural days which preceded the birth of Adam. This mode of treating the subject merely rescued the Scripture narrative from the imputation of falsehood, and supplied nothing in the way of confirmation of its truth and authenticity as a direct communication from God to man.

Besides the foregoing, there are two other classes of religious and philosophic inquirers, who have endeavoured to clear away the difficulties arising from the supposed insuperable discrepancy between the facts of geology and the language of Scripture.

Those who compose the one class, admit the facts of geology, but suggest such an imperfection of our knowledge of the original Hebrew in the present day as precludes all certainty of a right interpretation of its meaning;[2] or insist that the narrative is couched in the language of mythic poetry, and was not intended to be an historical detail of natural occurrences.[3] Those who belong to the other class, with more zeal than knowledge, admit the certainty of the meaning of the language of Scripture, but desperately and most unreasonably deny the facts of geology, or crowd them into the narrow compass of time which elapsed between the creation of man and the flood[4]—both of which propositions are demonstrably untrue and impossible.

These well-intentioned but weak advocates of Bible inspiration, in their endeavours to uphold, have betrayed the cause which they espouse, by conceding, either that Scripture is not, what it purports to be, an intelligible narrative of real events, or that it is inconsistent with the demonstrated facts of nature and science. More than this the sceptic need not require for the undermining and loosening of the whole fabric of divine revelation. If Scripture gives an uncertain sound in its first page, where are we to look for a sure word in any part of it? and if, to uphold the

[2] Babbage. [3] Baden Powell.

[4] Granville Penn, Fairholme, Kirby, S. Turner, Gisborne, Dean Cockburn, Taylor, &c.

Bible, it be necessary to deny facts established by the investigations of the most enlightened and distinguished of modern philosophers, so accurate and sure as to place them in the rank of sensible mathematical certainties,[5] the triumph of the infidel is complete. An unreasoning denial of well-ascertained facts will justify his equally unreasoning denial of the existence of the God of Nature and Revelation. It will not be necessary for us to enter into a more detailed consideration of these suggested explanations. They originated in a presumed discrepancy between the written and unwritten Record, which we shall prove not to exist; and when this position shall be established, the necessity for such extravagant and dangerous propositions will cease.

How then stands the question between geology and Scripture? Of those who have sought to explain and reconcile the apparent inconsistencies between the Mosaic Record and the facts of the geologist, some admit the certainty of the Scripture language, and the truth of geological phenomena, but avoid the supposed discrepancies between them, by contending that the narrative of Moses is not intended to be a narrative of the

[5] The learned and pious Dr. Pye Smith thus speaks of this science:—"Geology, as a science *deduced by the severest logic from phenomena*, which, when once fairly ascertained, a man can no more doubt of (I think I speak not too strongly) than he can doubt it is day when he sees the sun, can scarcely be said to have come into existence till within the last thirty or forty years."—*Geology and Scripture*, Sup. Notes.

creation of the animal and vegetable world of the geologist, but of another and a later world. Some again admit the facts of geology, but deny the certainty of the language of the Bible—while others concede the certainty of the Scripture language, but boldly ignore the facts of the geologist. Such a position of the issue between the believer and the sceptic is obviously unsatisfactory, and unfavourable to the cause of religion; which may, in such a state of circumstances, sustain injury, but cannot derive any benefit from the discoveries of this important science.

There is, moreover, in such arguments, a tacit admission of irreconcilable hostility between the written and unwritten Records of the Creation, which ought not to exist, if both proceeded from the same source. To take away this reproach from Revelation, and to restore and consolidate the union which must subsist between the Word and the Works of the great Author of all things, is the object of the following pages, in which we shall endeavour to prove, that without, on the one hand, distorting the language of the Sacred Record, or, on the other, ignoring or disturbing one of the well-established inductions of geology, the Record of Moses truly describes what the stony records of nature disclose to have been the course and order of the Creation—and with such accuracy, that after a full investigation and careful comparison of the facts of geology with the Scripture narrative, we do not hesitate to affirm, that the

most accomplished of geologists could not be entrusted to increase or diminish by a single line the Sacred Record, without endangering its truth and precision as an epitome of the divine process of framing and furnishing our wondrous world of life and order.

In the execution of our task, we shall, in the first place, as succinctly as is consistent with full information on the subject, sketch the nature and extent of the knowledge of the pre-Adamite world, with which we have been furnished by the researches of the geologist; and then proceed to show that the Record of Moses is a correct description of the successive scenes, of which our planet has been the theatre, since the time that God stretched forth the heavens, and laid the foundations of the earth.

CHAPTER II.

THE GEOLOGICAL RECORD OF THE CREATION.

"These are thy glorious work, Parent of Good,
Almighty!"—MILTON.

THE crust of the earth on which we dwell is a stony mass, covered, for the most part, with water or alluvial soil. The rocks of which this mass is composed are of different characters and species, and exhibit every variety of texture, from the soft and friable shales and sandstones, to the hardest and most compact marbles, granites, and crystals. These rocks are primarily divisible into two leading and well-defined classes, viz. Stratified and Unstratified.

The Stratified, which are also termed from their origin, Sedimentary and Aqueous rocks, are those which have been formed by deposits at the bottom of water, such as sand, mud, or lime: and which, by pressure and heat, with the aid of some chemical combinations, have become solidified and converted into stone, as we find them. These are found arranged in layers, and were originally laid down in horizontal, or nearly horizontal positions on the beds of the primeval oceans, seas, and lakes.

Thus sand is converted into sandstone, mud into shale, and lime into limestone.

The Unstratified rocks are those which have been formed by the action of fire, and which are, on that account, also termed Igneous. They are not found arranged in layers, but in irregular masses—not having been formed, like the stratified rocks, by horizontal deposits at the bottoms of the waters, but by the protrusion, from time to time, and in different localities, of heated and liquefied masses from below. To this class belong the Granitic rocks in all their varieties—Trap rocks, such as Basalt and Greenstone—and those of volcanic origin, as Lava, Obsidian, Pumice, and other stony substances of a scoriaceous texture.

It is considered to be a well-established fact, that the Granite, an unstratified rock, is the base or floor on which all the other strata have been formed.[1] This primordial rock is of igneous origin, and on it were deposited the first sedimentary strata—which latter, in their turn, became the base of another class of sedimentary strata; and so on, until we arrive at what is now the uppermost or outside coating or surface of the globe. Each of these sedimentary deposits became, in its turn, the stage on which the animal and

[1] Humboldt, after discussing the geological and other phenomena bearing upon the subject, concludes that "it is more than probable that a primitive granite rock is the substratum and support of the whole edifice of superimposed and fossiliferous strata."—*Cosmos*, vol. i. p. 275.

vegetable world, as they existed at the time, lived and grew, and in which they were then entombed and covered over by succeeding deposits; which latter, in their turn, became stages for the existence, and tombs for the remains, of succeeding races of animals and plants. To render this more intelligible, it must be stated, that while this process of the formation of the crust of our globe has been going on, portions of the beds of the seas and lakes have, by reason of internal disturbing forces, been frequently raised and elevated so as to become dry land; while, on the other hand, portions of the dry land have as frequently been depressed so as to have become submerged. There has, therefore, been a continual variation of the geographical limits of the land since its first appearance above the surface of the waters. And thus it is, that districts which have, at one period been the abode of submarine creatures, have, at another, been covered with land vegetation, and become the habitation of terrestrial animals.

There are many instances of these alternate elevations and depressions of the Earth's surface even within the historic era. A large tract of land upwards of one thousand miles in length and fifty in breadth, situate on the northern shores of the Baltic sea, has been for many years, and still is rising from the waters at the rate of four feet in a century; while, on the other hand, a large tract of the coast of Greenland has been gradually subsiding during the last four hundred years. The

whole continent of South America, according to Humboldt, has been sinking; and several islands in the Southern ocean, more especially in the Indian archipelago, have also subsided. The ruined temple of Jupiter Serapis, which stands on the northern shores of the Bay of Baiæ, presents us with a remarkable instance of the alternate depression and elevation of the same district within historic times. The building was originally a quadrangular erection, the roof of which was supported by a series of marble pillars, three of which are still standing. These columns are about forty-two feet in height. To the distance of twelve feet from the base they are smooth and uninjured; and then for the space of nine feet the stone is perforated with small holes, which have been made by a species of muscle called the *Modiola Lithophaga*, which could only have lived in sea water; and their shells have been found in these cavities. The remainder of the pillars above this perforated band are smooth like the lower part. The top of the perforated band is about twenty-three feet from the level of the water, which flows up almost to the base of the columns.

From these facts, it would appear that the ground on which the temple stands has, since the erection, subsided to the depth of twenty-three feet at the least, and has again been elevated to its present, or, as there is reason to believe, to a still higher level: and as it has been ascertained, from *certain inscriptions*, that the edifice had been

embellished by Marcus Aurelius about the middle, and by Septimus Severus about the close, of the second century, all these changes must have occurred within the last sixteen hundred years.

There are many instances, in various parts of the world, of submerged forests, the trees of which are to be seen standing erect beneath the waters; and, on the other hand, there are thickets and forests in various places, in which the roots and branches of forest trees are found intermingled with aquatic plants and shells; all of which phenomena evidence subsidings and elevations of a tranquil and gradual nature. The upheaval of the mountain ranges were most probably of a more sudden and violent description.

Before we enter on the consideration of the stratified rocks and their contents, it will be necessary briefly to examine the nature and origin of the unstratified granite base on which they rest.

That our planet was originally an incandescent fluid mass, there is little reason to doubt. The theory of internal or central heat, though sometimes questioned, no longer rests on conjecture, but on well-established facts. The shape of the earth, which is that of an oblate spheroid, flattened at the poles, and expanding at the equator, is exactly that which a fluid mass revolving round a fixed axis would assume. According to Humboldt, "the geometrical form of the earth reveals its earlier condition; an ellipsoid of revolution indicating a once soft and fluid mass." The dif-

ference between the equatorial and polar diameters is twenty-six miles, which corresponds precisely with the figure that a fluid body of the same mass as the earth, and revolving on its axis with the same velocity, would assume. Moreover, we find by actual experiment at the present day, that as we descend in mines towards the centre of the earth, the heat gradually increases, and with such regularity, that the depth of the mine can be ascertained by the state of the thermometer.[2] Again, the high temperature of water which rises in very deep borings of Artesian wells, the heat of which is found to increase proportionably with the depth of the sinking, and the occurrence of volcanoes ejecting masses of glowing and molten earth, hot mud, gases, and liquids, from fissures in the earth's surface, are strong evidences of the increase of temperature to very considerable depths in the upper terrestrial strata; and by analogy we may conclude, that it continues to increase to the centre of the globe.

The true theory would therefore appear to be, that the globe was originally a mass of matter, kept in a state of igneous fluidity by extreme heat,

[2] From thermometric observations which have been made in deep mines, and on the temperature of the water rising in Artesian wells, it has been ascertained, that as we descend from the surface into the depth of the earth's crust, the increase of temperature is 1° for every 50 feet of depth, which is an increase at the rate of 100° per mile. According to Humboldt, if we suppose this increase to continue in arithmetical ratio, a stratum of granite would be in a state of fusion at a depth of nearly 21 geographical miles.

but which, cooling down by radiation into space has become partly consolidated by progressive con densation, beginning at the surface, and advancing towards the centre. This theory of internal heat and the gradual cooling down of the globe, so as in process of time to be coated with a solid stony mass, is now received by the best-informed philo sophers as a fundamental and well-established fact and it will be found to be of great assistance in the elucidation and explanation of many geologica phenomena, and will also serve to clear up much that may appear to be obscure and apparently un meaning in the Mosaic narrative of the Creation.

It is to be observed, that the effect of this pro cess of refrigeration must have been to condense the gases capable of constituting the two fluid substances, Water and Air, round and upon the globe. Water is formed by the chemical union of the two gases, Oxygen and Hydrogen; and it has been experimentally decomposed into these two constituent elements by dropping on it fused glo bules of melted platinum intensely heated. It has also been shown by Dr. Romney Robinson, that as the temperature of water is increased up to 212 *the chemical affinity* of its elementary gases is les sened, and eventually destroyed. Hence, it has been suggested, that when the temperature is in creased to a great extent, such as that which did once exist at the surface, and which we have rea son to know still exists in the interior of our globe the gases may intermingle without a tendency t

unite, being kept separate by the intensity of the heat. It follows from this, that if our planet was originally a molten fluid mass which had gradually cooled down until a crust had formed on it, as the elementary gases were thus refrigerated the chemical affinities gradually came into action, and the Oxygen and Hydrogen combined so as to form the compound Water. In the same way, at a certain point of surface temperature, by the union of Oxygen and Nitrogen, its constituent gases, Air was formed.

This affords us a glimpse of the process by which the Almighty enveloped our planet with its two transparent robes of Water and Air, without which it could never have become a fit habitation for the animal and vegetable kingdoms which have successively occupied it. For, in the perfecting of his works, God has always acted consistently, and in accordance with those laws which He ordained at the creation of the first elements of mundane matter; and in the production of his highest and most minute effects, He is the same yesterday, to-day, and for ever. These principles are of importance in our estimate of the order or relative periods of the formation of Water and Air, with respect to the other items of the Creation; because we know from chemical science, that water could not have been formed until after the creation of the pre-existing gaseous elements; and also, that the globe must have cooled down to a certain degree of temperature, before that *the gases* could have combined in that

chemical union which contributed to the formation of the Water and the Air with which we are surrounded.

The external crust of our planet, which was thus formed by refrigeration, was a *granite formation*: and in all probability of the same crystalline texture and character as that which has subsequently been protruded upwards through the stratified rocks, and forms the substance of our largest mountains. This surface, thus formed by the cooling down of the molten mass, being covered with water, and still in a high state of temperature, and being subject also to constant eruptions of molten earth, mud, and gases from beneath, a considerable disintegration of the particles of the granite must have been occasioned; which, being mingled with the water and vapour, generated a deposit, that, becoming gradually solidified and indurated, formed at the bottom of the ancient ocean the first layers of stratified rock. The rocks which are found to rest immediately upon the granite show that such was their origin, as they are manifestly stratified and composed, for the most part, of the disintegrated materials of the underlying granite. In like manner, the higher strata, or systems of rocks (with the exception of limestone, and some other chemically-formed rocks), will be found to have been, to a great extent, produced by the degradation of rocks older than themselves.[3] The various gases, and newly

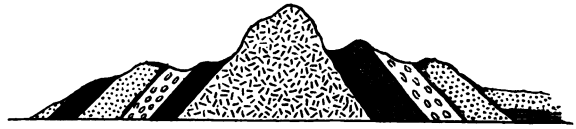
[3] "Aqueous or stratified rocks were divided into two great classes, the mechanically formed and the chemically formed.

created substances, both animal and vegetable, have, of course, caused corresponding variations in the natures and textures of these stratified rocks; but there can be no doubt but that all of them, from the primordial granite upwards to the present surface of the globe, have been formed in the manner described.

These different strata of the earth's crust vary in thickness; but in the aggregate, as we shall presently find, they would, *if regularly superimposed*, extend to a depth of 82,600 feet, or upwards of fifteen miles from the surface downwards to the granite. It is evident, therefore, that if they had remained in a state of tranquillity after their deposition and induration, resting conformably on each other like the coats of an onion, man could have ascertained nothing respecting the structure of the greater part of them, or the nature of the organic remains with which they abound. Their unattainable depths in the earth would have preserved their secrets from his inquiring spirit; and the wondrous creations of the primeval ages,

Of the latter class limestone is the only abundant rock; and of all the aqueous rocks we are acquainted with, by far the largest portion, both in extent and thickness, have been mechanically formed. Speaking roughly, we may say that all aqueous rocks (except limestone) are the result of the wear and tear of previously existing rocks; but if *all* aqueous rocks were thus formed, those rocks which previously existed must have been igneous, since there is no other class of rocks than these two. It follows then, that before any aqueous rocks were formed, the surface of the globe was entirely composed of igneous rocks."—*Jukes' Physical Geology*, p. 123.

which have been brought to light by the geologist, would never have been made known to the human race. But by the agency of the central heat of the globe, the lowest of these strata have been brought within our reach. This disturbing power has, from time to time, during the formation of the several series of rocks, displayed its activity in earthquakes and volcanic eruptions; and by protruding the expanding masses of igneous rocks from below, and elevating them into mountains, the superincumbent layers of stratified rocks have been upheaved along with them, and thereby the disrupted edges of the lower strata have been exposed to view, and with their contents submitted to the inspection of the geologist.



GEOLOGICAL SECTION.

The effect of these upheaving forces in facilitating the inspection of the lower strata, has been illustrated by a pile of books packed in a chest or deep box. If they are placed on their sides, over each other, it is obvious that the contents of the lower volumes could be ascertained only by taking out those that were lying above them; whereas, if the same books were arranged vertically in the same box, like books on the shelves of a library, the contents of each and all could be read off on their lettered backs, without

labour or difficulty. The perusal of the contents of the strata of the earth, thus forced up like a series of volumes, is the science of the geologist: and its certainty is assured by the fact, that the corresponding volumes, or series of rocks, are never found to contradict each other; but every volume contains its own peculiar story; and whenever a corresponding one is found, the same legends are repeated.

Without this disturbing influence, and the elevation of mountain chains, our planet would have consisted of horizontal strata regularly superimposed upon each other. "From pole to pole, under every region, continents would have presented to the eye the dreary uniformity of the Llanos of South America, or the steppes of Northern Asia; the vault of heaven would have every where appeared to rest on the unbroken plain, and the stars to rise and set as in the horizon of the ocean." [4] But at all periods, since the formation of the earth's crust, subterraneous forces have been diversifying the surface—elevating in one place, and depressing in another.

We now come to a consideration in detail of the several systems of the stratified rocks, which have been, at successive periods, and under different circumstances, deposited in the manner described, from the granite base upwards to the present surface of the earth. These various strata are divided by geologists into three classes—the *Primary*, the *Secondary*, and the *Tertiary*. Each

[4] Cosmos, vol. i. p. 242.

of these divisions comprises several subordinate component strata, which are distinguished by their composition, texture, and the fossil remains of the plants and animals which are found in them. The *Primary* comprises the Cambrian or bottom rocks (sometimes denominated the Azoic), the Silurian, the Devonian or Old Red Sandstone, the Carboniferous or Coal system, and the Permian. The *Secondary*, which succeeds, comprises the Trias and Oolite, and the Cretaceous or Chalk formation. And the *Tertiary* consists of the Eocene, Meiocene, Pleiocene, and the Pleistocene, or superficial deposits.

The following table shows these different formations, and the estimated thickness of each :—

PRIMARY.	Feet.
Azoic, or Cambrian	26,000
Silurian, Lower and Upper . . .	30,000
Devonian, or Old Red Sandstone .	9,000
Carboniferous, or Coal	10,000
Permian	2,000
SECONDARY.	
Trias and Oolite	2,500
Cretaceous, or Chalk	1,100
TERTIARY.	
Eocene, or *lower tertiary*	2,000
Meiocene, or *middle tertiary* . . .	
Pleiocene, or *upper tertiary* . . .	
Pleistocene, or *superficial deposits* .	
	82,600

The foregoing table exhibits the relative positions, or order of sequence, of each of these strata, reckoning from the granite upwards, though it is not probable, or even possible, that there can be any particular part of the globe at which the whole series is to be found. Some of them will always be absent, inasmuch as they were severally and respectively formed, as we have explained, by deposit at the bottom of the then existing waters; and therefore, wherever dry land existed during such periods, no such strata could, of course, be deposited. Nevertheless, whatever the strata may be in any locality, *the order of their sequence is fixed and invariable.* For instance, Silurian strata are never found above, nor Carboniferous strata below, the Old Red Sandstone: and so of the others. It would, therefore, be a fruitless task to seek for Carboniferous strata beneath a formation of Silurian or Devonian Rocks, or to expect to find chalk below a bed of the Oolite or Permian systems.

THE CAMBRIAN SYSTEM.

Those portions of the Cambrian system of stratified rocks, which were deposited immediately upon the granite floor, or primitive crust of our planet, belong to a class of rocks which have been commonly termed by geologists, Gneiss and Mica Schist. Though manifestly stratified, they are of a crystalline texture, and differ little in substance

from the underlying granite, having been for the most part formed of its disintegrated materials. They have been denominated metamorphic rocks, having undergone a change or metamorphosis, from the highly heated surface on which they were deposited, which has partially crystallized them; so that their lines of stratification are indistinct, and sometimes altogether obliterated. They are wholly unfossiliferous; and no traces of organic life, animal or vegetable, have been found in them. They have, therefore, been termed "Azoic," or lifeless. Immediately above, and in continuation of these, we find a sedimentary formation composed of mud, sand, and pebbles, which was deposited under less turbulent circumstances. These bottom rocks are of enormous thickness, estimated by the measurements of Sir Roderick Murchison to extend to the depth of 26,000 feet,[5] and which must have occupied a vast extent of time in their formation. They were long supposed to have been wholly unfossiliferous in their entire extent and depth; no traces of plants, or animals, or of their organic remains, having been discovered in them until a very recent period. On this account, they also were termed Azoic (lifeless): and geologists naturally concluded, that throughout this period, which was occupied in their deposition, *the era of physical life on our globe had not commenced.*

These conclusions have, however, been modified by the recent discovery of a fossil Zoophyte of

[5] Siluria, p. 174.

simple structure, and low organization (the Oldhamia), in the rocks at Brayhead, near Dublin, which belong to the Cambrian system. Numerous traces of Annelides (marine worms) have also been found by Mr. J. R. Kinahan, in the same locality, and a well-defined fossil form of one of them, of the Tubicola order (Histroderma Hib.), with branchiæ, or tentacles protruding from the head. The remains of a species of Trilobite (a Crustacean, which will be more fully described hereafter) have, it is said, been discovered in the Longmynd, of North Wales, which is likewise a member of this system; and with them also were associated the markings of Annelides, and some other faint indications of organic life.[6] It becomes necessary, therefore, to confine the term "Azoic" to the metamorphic rocks in which no fossil record of animals or plants has yet appeared; and where it occurs in the following pages, it must be understood as designating that

OLDHAMIA.

[6] See the Quart. Journ. Geol. Soc. vol. xii. p. 246, where Mr. Salter has described and delineated the fossil which he has concluded to be the remains of a Trilobite, of a genus hitherto unknown. These fossil remains are somewhat indistinct in form and appearance; and whatever the rank of the organism may be, it is obvious that we have not sufficient means for ascertaining whether it was furnished with any organs of sense higher than those of the Zoophyte, which did not include *sight or hearing*.

section of the Cambrian formation only. Should any vestiges of organic life present themselves hereafter to the exploring eye of the geologist within the precincts of these foundation-stones of the stratified rocks, it will be necessary to limit the extent of the Azoic rocks still more.

Such is the whole history of the zoology of this twilight dawn of physical life upon our planet, which the geologist has hitherto deciphered in these ancient rocks; and it must be admitted, that these first traces of vitality are scanty, difficult to detect, and difficult to define; but, at the same time, they are such as we might expect to find them, if there had been a beginning of life on our globe, which had progressed from the few to the many, and from the lower to the higher orders of animal and vegetable organizations. It would be obviously impossible to determine, by direct observation, the relative order, in point of time, of the entry into life of the different families of these first-born inhabitants of our planet. But we may observe, that the *modus operandi* of creative powers, which will be found, as we advance in our geological investigations, to be consistently progressive from the inferior to the superior forms of organic life, leads to the conclusion, that the first created of living beings could not have ranked *higher* in the scale of physical organization than the Zoophyte—a creature which holds a position in the scale of being intermediate between the animal and the vegetable, partaking of the natures

of both, and wholly devoid of the higher organs of sense, such as *sight* and *hearing*.

The era of the formation of the Azoic rocks, when our planet was a lifeless mass, has been thus described by Professor Ansted:—"These lowest and oldest of the sedimentary strata, whose antiquity is, in many places, unquestionable, which repose on the bare skeleton—the rocky framework of the earth—thus occupy a fixed, a prominent, and an important place among the rocks of which the earth's crust is made up. They also mark a strange and dark passage from that state which has been mentioned as chaotic, to a condition of regular and quiet deposit; they are, however, as far as we can tell, and with reference to other sedimentary rocks, Azoic (lifeless); but they form a class almost as *widely spread*, and as *distinctly universal*, as the granitic rocks themselves. . . . On their surface, however, all was then bare and desolate—not a moss, not a lichen, then covered the naked framework of the globe; not a sea-weed floated on the broad ocean; not an animalcule was present in the whole of the wide expanse—all was still, with the stillness of absolute death. The earth was prepared, and the fiat of the Creator had gone forth: but there was as yet no inhabitant, and no form of life had been introduced to perform its part in the great mystery of creation."

At the time of the deposition of the sediments which form the substance of the metamorphic rocks,

the surface of the earth must have been of an exceeding high temperature, as appears from their crystalline and contorted structure. In these early stages of progressive creation, the cooling process had not sufficiently advanced to admit of the existence of animal or vegetable life; and hence it is that no fossil remains are to be found in them; and from the proximity and strength of the internal heat of the globe, volcanic action, and ejections of hot steam, mud, gases, and liquids, must have been frequent and violent. The result of such conditions would be, that the disintegration of the granite base would be very considerable and rapid, and a sediment, composed of the constituent particles of the granite, (mica, quartz, and felspar,) would be formed, which would exactly correspond with that which the bottom rocks now present as the material of their composition.

It thus appears to be a well-established and unquestionable fact, that during, and for long ages after, the formation of the granite crust on the molten mass of terrestrial matter, *the globe was devoid of organic* life, animal or vegetable. This long period is not, either as regards its duration or its distance from our era, to be calculated by days or years, or by any other known measure of time. Its extent is represented by the incalculable time occupied in the cooling down of the molten mass and formation of the Earth's granite crust, and a great portion of the vast pile of these sedimentary bottom rocks, which have been computed, by Sir

Roderick Murchison's measurements, to be nearly five miles in depth, and were formed by the slow deposit and induration of the muddy sediment of which they are composed; and its distance from our own times, can only be estimated by the long periods which must have been occupied by the formation of the various systems of rocks, which we shall find to have been successively deposited between the era of the Azoic system and that of the human race. *The Azoic period*, or the time occupied by the slow operation of depositing the sediment, of which the metamorphic rocks are composed, on the granite bed of the ocean, to the depth, in all probability, of some miles, must have been vast indeed; but still it manifestly had a commencement and a termination, which is all that concerns us to know of its duration.

It is a strange and interesting circumstance that we can thus, with the aid of the geologist, ascend the stream of time to a period at which our planet was lifeless throughout its whole expanse; and that we can arrive at a *beginning* of animal and vegetable creation, and find ourselves in a position to contemplate and ascertain the state of the globe, before that the first pulsation of organic life had stirred within its precincts. Here is instruction of a novel and solemn description. In such paths of knowledge, we may be said to walk with God, and to share his counsels before our world of life began—when as yet his creative spirit had not poured light and vitality

on a scene that is now furnished and adorned with the countless glories of animated nature; and we no longer believe, merely because it is written, that there was a beginning of life and order, but because we have the additional evidence of our senses to attest the fact. It is true that this evidence is only negative in its nature, but the succeeding systems of rocks, and their contents, will show that it is as conclusive and convincing as any direct and positive evidence could be; for, ascending from this unfossiliferous formation to the next formation which rests upon it, we shall there discover the fossil remains of animal life of the *lowest class of organic existences*, expanding gradually as we proceed upwards through the other systems, into those of *higher orders*, until we reach the present surface of the earth, where we find the highest of all the orders of organic life in the form of man. Therefore, the negative evidence, arising from the absence of all appearance of life in the Azoic strata, will be confirmed by the direct evidence of the commencement of life in its *lowest form* in the next succeeding strata, and of its gradual progress from that commencement to the human era.

We have already noticed the species of living creatures that were the first known inhabitants of our planet, and which entered into life in the era of the deposition of that part of the Cambrian system that rests on the metamorphic rocks. These, we have seen, were few in number, and low in the scale of

nization.

We now proceed to the consideration of the next ceeding system of rocks, in which life, though ll of the same lowly description, is more abun- ınt and better defined. This has been termed

THE SILURIAN SYSTEM.

This formation, which rests conformably on the Cambrian rocks, has been denominated by Sir Roderick Murchison, "the Silurian," in consequence of the district in this country in which it is most fully developed, having been, at one period of its history, the locality of the ancient tribe of the Silures, extending through the greatest part of South Wales and the western counties of England. These rocks, which are divided into two classes, the lower and upper Silurian, and the fossil remains with which they are charged, have been fully and faithfully depicted by the foregoing eloquent writer in his "Siluria;" and the nature and organization of the several species of the creatures which had their being during the primeval period of the deposition of the system, have been carefully investigated and graphically portrayed by him. For a detailed description and accurate delineation of these early inhabitants of our globe, the reader must resort to the foregoing work, which will supply him with all the information that the researches of the most inquiring of geologists have brought to light on the subject. It will be sufficient for our purpose to state, that the only living

creatures that were to be found on the face of the globe during the Silurian period, as evidenced by their exhumed fossil remains, were of the classes or families of Zoophytes, Mollusks, and Crustaceans—all of them *submarine invertebrate animals.*[7] Of the vegetable creation, no traces are to be found beyond the casts of some specimens of Fucoids or Sea-weeds.

Of the family of Zoophytes, creatures that partake of both the animal and vegetable nature, and which therefore rank low in the scale of physical organization, there are many species. They appear to have been *the earliest* of created organic beings; and the most remarkable in this system are the Graptolites—small serrated creatures, which in form resemble a comb—Corals of various descriptions, and Encrinites, or Stone-lilies, so called from their resemblance in form to the common lily. Of these latter there appears to have been a great variety of species; and, judging from the immense extent of their remains, which occupy and actually compose successions of marble strata

GRAPTOLITE.

[7] The great division of the animal kingdom is into *Vertebrates* and *Invertebrates*. The Vertebrates comprise all those animals which are furnished with a vertical column, or backbone, and its accompanying internal skeleton. To this class belong Fishes Reptiles, Birds, Mammals, and the Human race. The Invertebrates are those animals which have no backbone; and to this class belong Zoophytes, Mollusks, Crustaceans, and Insects.

many feet in thickness and many miles in extent, the beds of the primeval waters must have been in many parts studded with them. According to Dr. Buckland, the Entrochal marble, of great extent in Europe and America, is often almost as entirely made up of the petrified bones of Encrinites, as a corn-rick is composed of straws. This Zoophyte is a species of star-fish fixed on the top of a flexible stalk, rising from, and fastened to, the bottom of the water, furnished with long tentacles or fingers, armed with suckers like the cuttle-fish, stretching forth in every direction, and with which they seized their prey, and conveyed it to a stomach of simple structure, containing viscera, with one aperture. The body, stalk, and fingers or arms, were composed of numerous calcareous plates and rings, amounting to many thousands in each of these members, curiously elaborated, and fitted with such nice contrivances to each other, that the animal could turn and bend in all directions without fracture or dislocation, either in pursuit of its prey, or under the influence of the tides and currents of its native seas. Though so abundant in these primeval ages, there are only two now existing representatives of the class, viz. the Pentacrinus Caput

ENCRINITE.

Medusæ, and the Comatula, both of them exceedingly rare.

Another class of the Silurian creation are the Mollusks, which are pulpy, boneless animals, most frequently furnished with external shells, like the oyster or muscle of the present day; or without a shell, like the common snail. Of these, the fossil contents of this system of rocks evidence a vast numerical extent of species, both Bivalves and Univalves.

Of the Bivalve, or double-shelled species, the most abundant of this formation belong to the Brachiopod species,[8] viz. Lingulæ, Rhynconella, Terebratulæ, and Spirifers, which, from their formidable apparatus for destruction, in the form of long tentacles or arms protruding from their shells, have been termed "the scavengers of the ancient seas," feeding upon other living species, or such animal matter as found its way to their haunts in the great depths. Of the Univalve, or single-shelled species, the principal were the Gasteropods and Cephalopods, some of which latter were also carnivorous, represented in the present day by the Nautilus and Cuttlefish, and, like them, capable of locomotion, and most voracious and destructive in their nature and habits.

[8] Brachiopods are bivale Mollusks, whose organs of locomotion consist of two long spiral arms protruding from the sides of the mouth; and with which, it is supposed, they also seize their prey. Gasteropods are univalves whose organs of motion are situate on the under surface of the body, as in the common snail. Cephalopods are also univalves whose locomotive organs are arranged round the head, in the form of arms or tentacles, as in the Cuttle-fish.

Of the Crustaceans, which are now represented by the Lobsters, Crabs, Shrimps, Crayfish, and other marine animals of that description, the most remarkable, and most highly developed, is the once numerous and extensive, but now extinct, family of Trilobites, of which there was a great variety of species. In shape, this animal resembled nearly the familiar form of the common Woodlouse (though of course on a comparatively gigantic scale); but the body was divided into three sections by two longitudinal grooves, giving it a trilobed appearance, from whence its name has been derived. It was furnished with an eye, which has been preserved in some of the fossils in such a state of perfection, as proves to demonstration that the nature of the water, the air, and the light, must have been substantially "the same at the time when Crustaceans endowed with the faculty of vision were first placed at the bottom of the primeval seas, as at the present moment." Dr. Buckland observes,—"This point deserves peculiar consideration, as it offers the most ancient, and almost the only example yet found in the fossil world, of the preservation of parts so delicate as the visual organs of animals that ceased to live many thousands, and perhaps millions of years ago."[9] The animals of the

TRILOBITE.

[9] *Bridgewater* Treatise, vol. i. p. 396.

present day which approach nearest in form to the Trilobite, are the Limulus, or King Crab, and the Serolis.

The Crustaceans are, according to Sir Roderick Murchison, to be considered as the highest type of life of the Silurian division; and he goes on to state, that "it is indeed a remarkable fact, that the most sedulous research in many parts of the world has failed to discover the trace of any vertebrate animal in the lower division of the Silurian system. All the marine animals from Zoophytes to Crustaceans, and which probably amount to more than 1000 species already known, belong to the invertebrated classes, and no true fish has yet been discovered:" and his conclusion is, that "the name Silurian marks, therefore, the first series of fossiliferous deposits, throughout the great mass of which *no vertebrated animals have been anywhere discovered.*" [1]

Besides the foregoing invertebrates, casts of Fucoids or sea-weeds, flowerless and seedless, are found in the Silurian rocks; but with respect to *land plants*, no trace of their existence is to be discovered until we arrive at the very top of this system, and just beneath the lowest beds of the Old Red Sandstone, which is the next in succession; and the first evidence of the existence of vertebrate fishes has been found in the same position. In fact, as the highest authority on this subject states, "the very long Silurian era ha nearly passed away *before trees grew upon th*

[1] Siluria, pp. 205—240.

land, or fishes swam in the sea; . . . . the Silurian rocks extend over areas as large, if not larger, than any great system of the following periods; and yet in these alone, I repeat, is there an *entire absence of an arborescent vegetation.*" [2]

As then, in the Azoic, or lower section of the Cambrian system, there are no traces of either animal or vegetable life, so in those which succeed it, including the Silurian, which are subsequent in point of time, there is no trace of animal or vegetable existence, beyond submarine invertebrates—Zoophytes, Mollusks and Crustaceans, and Fucoids—the first forms in which the mystery of life presented itself on our planet.

These Silurian rocks, as well as the underlying Cambrian rocks, are found largely developed in every part of the earth where search has been made for them; and in all latitudes, whether in the torrid or temperate zone, the same species are found. They present themselves on the flanks of all the principal mountains in the world: showing that before their elevation, the sites they now occupy were covered with Cambrian and Silurian strata. It is probable, therefore, that the waters in which they were deposited must have extended all over the globe; and the circumstance that no land animals or plants were in existence during these periods, corroborates the conclusion that in the Cambrian and Silurian ages the ocean encir-

[2] Siluria, p. 475.

cled the earth, and spread an unbroken expans from pole to pole.

"Quâque fuit tellus, illuc et pontus et aer."

It is true that many of our geologists hav assumed that dry land, to some extent, prevaile throughout the Silurian epoch; but when w come to examine the grounds for such an assump tion, we find them altogether inadequate t establish the fact of any necessity for the exist ence of dry land during that period. Sir Charle Lyell states, "that there never was an univers ocean since the planet was inhabited, or rathe since the oldest groups of strata yet known t contain organic remains were found, is proved *b the presence of terrestrial plants, or by the ind cations of shores in all the older formations.*" The first of these reasons cannot be said to hav any application to the Cambrian or Silurian era as it is now well established that there are s *traces of terrestrial vegetation in either of them* and the only indication of the existence of shor in these older formations is stated to be the gre disintegration exhibited in these strata. "I our times, this process (disintegration) is usuall seen taking place chiefly in the atmosphere, an *at a point where land and water meet;* in a muc less activity below the surface of the ocean. would thus appear likely that there was dry lan in the eras of the earliest stratified formation

[3] Lyell's Principles of Geology, p. 665.

though, from whatever cause, it bore no vegetation, and sustained no animals, or was only a scene of life in certain rare and favourably situated places."[4]

This reasoning is obviously not conclusive as to the existence of land at those periods; more especially, when we consider that the present state of the globe, in relation to the causes of disintegration, is very different from the state of the globe in those primeval times, when disintegration was accelerated by volcanic action beneath the waters, in a much higher degree than it could have been by any atmospheric action. When, to use the language of Hugh Miller, "upheaving fires from the abyss, and ocean currents above, had contended in sublime antagonism, the one slowly elevating the entire tract, the other grinding it down and sweeping it away." There is, therefore, no necessity for a resort to atmospheric action on the materials of the globe, and, consequently, no necessity for the existence of shore, or dry land, to account for the phenomena of the great disintegration that appears to have taken place at the period of the deposition of these lower strata. So that *it may be true*, that no dry land was in existence on the globe until the close of the Silurian system, when the first unerring symptom of its existence, in the form of the fossil remains of terrestrial vegetation, makes its appearance. Nay more, it is rather in accordance with

[4] Vestiges of the Nat. Hist. of Creation, p. 40, 6th ed.

the economy and regularity which prevail throughout all the works of creation, that the appearance of land and land vegetation should be simultaneous, or nearly so. The first discovered fossil remains of a land plant tell the same tale to us that the olive branch revealed to Noah, in the days of the flood, that dry land had begun to appear above the surface of the waters.[5]

Such being the case, our planet, during the Silurian epoch, presented the aspect of an unbroken expanse of waters, inhabited by a population of exclusively marine invertebrate animals. Graptolites, Lingulæ, and other Bivalve Mollusks, were spread over the muddy bed of the shoreless ocean; myriads of Encrinites, like forests of marble lilies, waving gracefully to and fro on their elegant stalks, and spreading their numerous tentacles abroad in search of their prey; and the various species of the Trilobites and carnivorous Cephalopods roaming about, and with the equally voracious Brachiopods, keeping down the increasing population of the waters; showing that while the globe, and the life with which it was furnished, presented very different appearances

[5] "The mean elevation above the sea level of all the land in the globe—islands as well as continents, mountains as well as plains—is estimated by Humboldt at somewhat less than 1,000 feet. The mean depth of the great ocean of our planet is calculated by Laplace, from the tides and other phenomena, to be at least 21,000 feet. Thus, allowing full margin for errors, the entire submergence of the land might take place, leaving the central solid mass of the earth every where covered deeply with water." —*Edin. Rev.* No. 214, p. 369.

from those of after-days, the economy of nature has always been the same, regulating and securing the just proportion of creatures to the means of their subsistence, by the introduction of one class of animals to prey upon the others.

We are now at the close of the Silurian epoch. No dry land or land vegetation—no Quadruped, Reptile, Bird, nor any other vertebrate animal, has yet appeared on the stage of existence. Zoophytes, Mollusks, and Crustaceans are the sole living tenants of our planet. In humble form and lowly guise, life has commenced the slow and steady progress, by which it has advanced upwards, through various forms, to a being of intelligence and responsibility; and is still advancing onwards, until it shall merge again in the eternal and the infinite.

THE DEVONIAN, OR OLD RED SANDSTONE.

We now ascend another step in geological chronology, and enter on a period represented by the deposition of the strata or systems of rocks which rest on the Silurian, and which, from their composition, have been styled the "Old Red Sandstone." It is more generally known as "the Devonian," from the fact of its being largely developed in our own country, in the southern parts of Devonshire. It is also found in many other parts of England and Scotland, and throughout Europe, more especially in Russia, and in

America, and is thus introduced to our notice by Sir Roderick Murchison: "During the accumulation of nearly all the Silurian deposits, the bottom of the sea was, to a very wide extent, successively occupied by deposits of dark grey coloured mud. At the close of that period a great change occurred in the nature and colour of the sediment, over large areas of those ancient seas. In and around the Silurian region of Great Britain, for example, the grey mud was succeeded by red deposits, for the most part sandy; their colour being caused by the diffusion of iron oxides in their waters."[6] The metallic oxide by which these deposits were coloured, was no doubt of volcanic origin, and must have been attended with fatal effects to the then existing inhabitants of the deep, many species of which disappear, and are not again to be discovered in any of the succeeding formations.

The introduction of this system of rocks, all geologists agree, was accompanied with violent and extensive volcanic disturbances, which broke up the previous formations in numerous places, and upheaved them, with the protruded granite, from the waters into dry land, forming extensive mountain ranges. Geological research has informed us that, among others, the Grampian and Welsh ranges, Hartz mountains, Dofrafeld, Uralian, Atlas ranges, Mountains of the Moon, and other African ridges, the Andes, and Alleghanies,

[6] Siluria, p. 241.

were all elevated at this period.[7] Many others may have been elevated at the same time, which have, since then, sunk down and disappeared beneath our oceans.

We have seen that the first appearance of land plants was at the very top of the Silurian rocks, where the Old Red Sandstone rests on them. In the same position, the first Ichtholytes, or organic remains of fishes, the earliest of the vertebrates, were discovered. "The multiplied researches of the last twenty years have failed to detect the trace of a fish, amid the multitude of all other marine beings, in the various sediments which constitute the chief mass of the Silurian rocks. . . . The Silurian, except at its close, was therefore a series in which there appeared no example of that bony framework of completed vertebræ, from which, as approaching to the vertebrate archetype, the comparative anatomist traces the rise of creative power up to the formation of man."[8] Thus the principal features and characteristics of the system are the introduction *of land vegetation* and of ver-

[7] The relative ages of mountains are ascertained, on the principle that their elevation must have necessarily intervened between two periods, that is to say, between the deposition of the strata which have been upheaved and inclined, and of those which, extending horizontally above them, show that they must have been deposited subsequently to the inclination of those strata. Thus the Silurian strata are found leaning against the sides of those mountains, and the Old Red Sandstone forms an acute angle with the Silurian. They must therefore have emerged from the deep at the close of the Silurian era.

[8] Siluria, p. 460.

tebrate fishes on the stage of existence. From the fossil remains, we find that the land plants, which were at first few and small, increase considerably in number and dimensions as we proceed upwards and onwards, until they expand into the rank luxuriant vegetation from which the extensive coal beds of the Carboniferous formations were, as we shall presently see, furnished.

Zoophytes, Brachiopods, Gasteropods, and Cephalopods are still abundant; Crustaceans have diminished. But the new creation which characterises and distinguishes the zoology of the Devonian from that of the Silurian system, is the Vertebrate Fish, of which upwards of one hundred and fifty species have been already named and described. For a detailed account of these, the monarchs of the creation in their day, we must refer the reader to the works of Cuvier and Agassiz, and to the interesting writings of the eloquent author of the "Old Red Sandstone." We shall only notice a few particulars connected with them, which will be found hereafter to bear on the subject of our inquiry.

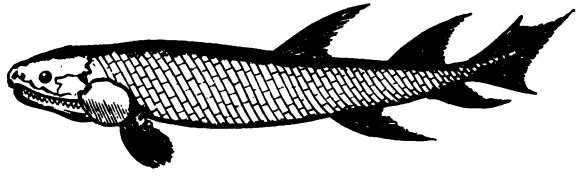
From the Icthyolites, or fossil remains of these fishes, we learn that the first created of the class differed considerably in character and appearance from their descendants, which now fill the waters of the earth. All the fishes of this formation were cartilaginous, clad in strong integuments of bone composed of enamelled plates, instead of the horny scales which cover those of more recent times;

and have been distinguished by naturalists into two classes, derived from the arrangements of these osseous plates on the body of the animal, viz. Placoids and Ganoids. Those comprised in the first of these classes, are coated with these irregular enamelled plates, fitted edge to edge, like a tesselated pavement; in the second, the bony plates are placed regularly over each other, like the scales of the common fish of modern times. Besides this bony armour, there is another remarkable peculiarity which characterises these ancient tenants of the deep, in the structure and form of the tail. All of the fishes of our own era, with very few exceptions, are furnished with what are termed bilobed or homocercal tails; that is to say, the tail commences at the extremity of the vertebral column, and branches out into two

HOMOCERCAL AND HETEROCERCAL TAILS.

equal sections, as we see in the salmon, perch, herring, and all other fishes of the present day, with the exception of the pike, sturgeon, and dog-fish,—while, in the fishes of the older formations, the vertebral column is continued into the tail; or, more properly speaking, the tail is developed

on both sides of the spine, but much more largely on the under than on the upper side, forming what is called a one-sided, or heterocercal tail, which, therefore, resembles a caudal fin rather than a tail. This one-sided formation of tail is invariably united to the body or enamelled covering; and the order to which they belong appears to have continued throughout the different systems, from the Old Red Sandstone to the Chalk, where they became, in a great measure, extinct, and are succeeded by the fish with horny scales, and bilobed or homocercal tails, which are still in existence.[9]



OSTEOLEPIS—DEVONIAN FISH.

It is a well-known fact, that fish can sustain a higher degree of temperature than any other animal, from the fact of their being found in hot springs in different parts of the world, where no other form of *organic* life could exist; and it has been suggested by Dr. Buckland, that the use of

[9] The horny scaled fishes of modern times are divided by naturalists into two classes, viz. Ctenoid and Cycloid; and are distinguished by the forms of their respective scales; those of the former being jagged on the edge like the teeth of a comb, as in the perch, while those of the latter are smooth and circular, as in the herring.

the thick bony and enamelled scales surrounding like a cuirass the entire bodies of these ancient fishes, may have formed a defence against the injurious effects of waters of a high temperature. In connexion with, and in confirmation of this hypothesis, Hugh Miller has observed, that about the time of the disappearance of this ancient race of fishes, we have the earliest indications of the commencement of the *alternations* of summer heat and winter cold, in the appearance of annual season rings in the fossil trees. "*Just as winter began to take its place among the seasons, the fish fitted for a highly-heated medium disappeared:* they were created to inhabit a thermal ocean, and died away as it cooled down."[1] Thus the hypothesis that the Placoid and Ganoid orders of fishes were adapted to, and inhabited, tepid seas, is confirmed by the interesting fact, that they begin to disappear when the fossil remains of the succeeding formations attest that the internal temperature of the globe had so far cooled down, that the influence of the sun could operate to the extent of producing a variation of seasons on the surface of the earth. The presence, therefore, of these ancient forms of marine life, are, to some extent, an evidence of the tepid state of the primeval waters in which they lived.

What then is the history which has been traced and expounded by the geologist of our planet's existence during the long period presented by

[1] The Old Red Sandstone, pp. 161, 162, 5th ed.

the 10,000 feet of the Old Red Sandstone which were deposited on the Silurian rocks? Its dawn was ushered in by a burst of volcanic eruptions, upheaving in different localities the underlying granite, and lifting up with it the Cambrian and Silurian strata which were spread over it; and thereby forming dry land above the surface of the waters. Land vegetation soon made its appearance to decorate the new-born earth; and vertebrate fishes were at the same time added to the previously existing submarine invertebrate denizens of the deep; while these newly-created mailed animals attest a continuance of a high temperature on the globe throughout the whole period. The progress of the creation is manifest and well-defined. We shall now advance another step in the examination of our strange and interesting stony record of the remote past.

THE CARBONIFEROUS SYSTEM.

The system which succeeded, and rests on, the Old Red Sandstone, has been termed "The Carboniferous." The deposits of this era were of various descriptions—Sandstone, Shale, and Limestone, with two other rock substances, of no little importance, which made their appearances for the first time, viz. Ironstone and coal. But though both of these formations are largely developed, it is the latter that has always been considered to be the characteristic and distinguishing feature of the system; and the investigation of the constitution

of this mineral, and the circumstances under which it was formed, will prove not only highly interesting, but of the greatest assistance to us in the inquiry in which we are engaged.

It is a fact, now admitted by all naturalists and chemists, that terrestrial vegetation was the substance of which the masses of coal, which are found in such abundance beneath the surface of the earth in various parts of the world, have been formed. The trees and herbage of the primeval forests were the raw material out of which this source of so much of the conveniences and comforts of life has been manufactured, and preserved through untold ages for the sole benefit of the human race. The main ingredient of the mineral is Carbon, and it is also the chief element which enters into the composition of the vegetable creation. Moreover, as we shall presently see, it reveals, on close inspection, a vegetable structure, which leaves no doubt of its organic origin. But the most exuberant and luxuriant vegetation that has ever been witnessed by the eye of man in the most prolific regions of the now existing earth, is mere waste and barrenness when compared with the profuse and rapidly developed vegetable productions of the primeval period, which formed the basis of the coal measures.

These coal measures consist of bands, or veins, of the mineral substance of Coal, alternating with, or separated from each other, by interposed strata of Sandstones, Shales, beds of Limestone, and

Ironstone. This position and structure of t formation has given rise to a difference of opini among geologists as to the nature of the proc by which the vegetable has been converted ir the mineral substance. All agree that the trar mutation has taken place by submergence of t vegetation under water, sand and gravel, and t exclusion of air; but whether the land on which tl luxuriant vegetation flourished and decayed, w submerged and covered over with sand and sha and again elevated for the production of anotl area of vegetable matter, to be again submerg and formed into another and upper vein of coal, or whether the great masses of the vegetable matt of which the coal measures were composed, we from time to time drifted into lakes and estuari by rivers and inundations, forming deltas of va extent and thickness, has been the subject of mu controversy and discussion; but as to the su stance of which the Coal measures have be formed, there can be none. The vegetable remai have completely changed their character a colour; but by chemical analysis the vegetal structure can be detected; and also, by cutti the coal and polishing it down into thin trar parent slices, the fibres and cells of the plar of which it is composed are plainly revealed the microscope: and from the same source we d cover, that the nature of the plants were similar those which now grow in the clusters of islan which are scattered throughout the tropical sea

or within the mountain valleys of equinoctial regions.

From this circumstance we learn, that a high temperature must have prevailed in those days even in the polar regions of the earth, inasmuch as the Coal strata are found in great abundance, not only in the temperate, but in the frigid zones —in India and Australia, in the southern hemisphere; and in Melville Island and Baffin's Bay, in the northern.[2] Such a temperature could not have been caused by the influence of the sun in latitudes so remote from each other, and must, therefore, have proceeded from the earth itself. Here again, we have evidence of the existence of the internal or central heat of the globe, and of the continuance down to this period of its history. The true explanation is, that the incandescent globe had not sufficiently cooled to admit of animal or vegetable life in the Azoic or Cambrian era, but was sufficiently cooled, during the Silurian and Devonian epochs, to permit of the creation and existence of Zoophytes, Mollusks, Crustaceans, Fucoids, and certain classes of fishes

[2] Coal is not confined to the Carboniferous system. Anthracite coal, the product of marine plants, is found in the Silurian strata in Ireland and Portugal. In Spain, mines of the same mineral are worked in the Devonian; and in Saxony, in the Permian system. The Oolites of Scotland, America, and the East Indies, also yield coal; and the brown coal of Germany and Austria is found in the Meiocene of the Tertiaries. But in none of these places does the mineral approach in quality or extent the product of the great coal measures of the Carboniferous system.

and plants; and had become genial enough, during the Carboniferous era, to foster the rich luxuriant vegetation that formed its distinguishing characteristic. The extensive exhalations of carbonic acid gas which issued from the tepid earth, mingling with the atmosphere, must have assisted this profuse growth. According to Humboldt, "it is very probable that in an earlier condition of the globe, far greater emissions of carbonic acid gas mingled with the atmosphere, and heightened the process by which plants assimilate carbon; and thus vast forests were formed, which in subsequent revolutions were destroyed, and inexhaustible stores of fuel (lignites and coal) were buried in the terrestrial strata thus forming at the surface." [3]

But not only have geologists ascertained the general vegetable structure of the Coal measures, their researches have disclosed the nature and character of the several plants, which enter into the composition of the mineral; and which, therefore, must have clothed the earth at the period of their formation. A brief consideration of the various species of the trees of this primeval era, and of the climatal conditions of the earth and atmosphere necessary for their production, will prove, not merely interesting and instructive as a scientific inquiry, but of great value in its consequences to the cause of the truth and inspiration of the Scripture record of the creation.

The plants which have contributed most ex[

[3] Cosmos, vol. i. p. 190.

sively to the formation of Coal, are referrible to five different genera, viz. Ferns, Calamites, Lepidodendra, Sigillaria, and Stigmaria. They are thus enumerated by Dr. Buckland, and all succeeding geological writers.

FERNS. Of this tribe of plants there is a singular preponderance among the Coal fossils, insomuch that it has been termed the master form or type of the Carboniferous era. In the great Coal formation there are, according to Brongniart, about 250 ascertained species of Ferns, forming about one half of the entire known Flora of this formation;[4] and Mr. Brown, in the Appendix to Tuckey's Congo Expedition, states that the circumstances most favourable to the growth of Ferns are *Humidity, Shade, and Heat*—a fact well known to all botanists.

CALAMITES are the next most numerous of the Carboniferous plants. It is a gigantic reed of the family of the Equisetum, or common Mare's-tail, which is to be seen in great abundance in marshy situations in all latitudes—with this difference, that while the diameter of the Equisetum of the present day rarely exceeds half an inch, the Calamite of the

CALAMITE.

[4] Bridgewater Treatise, vol. i. p. 464.

Carboniferous age frequently exceeds a foot in diameter, and is many yards in height. The stems, when found in horizontal, or nearly horizontal positions, are *compressed and flat,* indicating that the plant was *soft and succulent* in its nature.

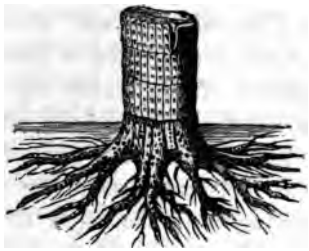
THE LEPIDODENDRON, of which thirty-four species are enumerated in Brongniart's catalogue of fossil plants of the Coal formation, belongs to the family of Lycopodiaceæ, or Club-mosses. They are stated to follow nearly the same law as Ferns and Equisetaceæ, in respect of geographical distribution; and were, therefore, produced under similar climatal circumstances of *shade, heat, and moisture.* They attained an enormous size in the Carboniferous era, the fragments of the stems occurring from twenty to forty-five feet in length, and upwards of four feet in diameter. They are also found *compressed and flattened* in the coal mines, attesting the *softness and succulency* of their structure.

LEPIDODENDRON.

SIGILLARIA are a species of plants unknown to modern vegetation, though very abundant in the

Coal formation. They are described by Dr. Buckland as lying inclined at all degrees throughout the coal strata; "but are most frequently prostrate, and parallel to the lines of stratification, and in this position are *usually compressed.*" When erect, or highly inclined, the interior is filled with sand or clay; from which he infers, that "the bark, which alone remains, and has been converted into coal, probably surrounded an axis composed of *soft and perishable pulpy matter*," which by decay made room for the sand and clay. They attained the extraordinary dimensions of from fifty to seventy feet in height, and from half a foot to three feet in diameter. Brongniart enumerates forty-two species of Sigillaria, and considers them to have been nearly allied to arborescent Ferns.

STIGMARIA, from the length and form of their leaves and branches, were long supposed to have been aquatic plants of a distinct species, trailing in swamps and lakes; and are thus described by Dr. Buckland: "The centre of the plant presents a dome-shaped trunk or stem, three or four feet in diameter, the substance of which was probably yielding and fleshy." It has, however, been discovered,



SIGILLARIA, WITH STIGMARIA.

and it is now a well-established fact, that the Stigmaria is the root of the Sigillaria, having been found, in many recent instances, attached to the stem of that plant. Besides the foregoing, some species of Coniferæ, of the Aracaurian tribe, are found among the Carboniferous plants; but they are comparatively few in number.

Thus one half, at least, of the Flora which were the occupants of the dense forests of the Carboniferous era, viz. the Ferns, were of a nature which required a vast proportion and prolonged continuance of *shade, heat, and humidity*, for their extensive production; while the remainder, with the exception of a few Coniferæ, were, for the most part, if not altogether, though large in their dimensions, *soft and succulent* in their substance—a texture which is likewise the offspring of similar climatal conditions. We must therefore conclude, that during the growth of the exuberant terrestrial vegetation of the Carboniferous era, there must have been a remarkable combination of these circumstances. The surface of the earth must have been *shaded from the direct rays of the sun*, while the atmosphere must have been charged with both warmth and moisture, producing a steamy vapour most conducive to the rapid and extensive growth of every description of the then existing vegetation. In our own days, we know that the gigantic forests of the damp mountain valleys of the tropics are produced under similar conditions of shade, heat, and humidity, which

must therefore have prevailed to a still greater extent during the far more prolific vegetation of the Carboniferous period of our planet's existence.

> "Here lofty trees, to ancient song unknown,
> The noble sons of potent heat and floods
> Prone rushing from the clouds, rear high to Heaven
> Their thorny stems, and broad around them throw
> Meridian gloom."

As regards the fossil remains of animals in this system, they are mainly identical in general character with those of the preceding ages, but fewer in number; and such as they are, we find them principally in the limestone sections which alternate with the coal seams. There are, however, some objects which present an important advance in the work of creation. The principal of these are the Sauroid fishes, bearing some traits of resemblance to the family of Saurian reptiles, which form a prominent feature in the succeeding strata. Here also have been discovered the first traces of terrestrial animals in the forms of insects of a low order, and reptiles of the Batrachian or frog species; and one specimen of the latter as low down as the top of the Old Red Sandstone.[5] Previous to, and throughout the era, the atmosphere was impregnated with those large quantities of carbonic acid, which have become fixed in the wide and deep masses of the mountain limestone and coal measures, that compose so large a proportion of the

[5] The Telerpeton Elginense, described and delineated by Dr. Mantell in the Quart. Jour. Geol. Soc. vol. viii. p. 100.

earth's crust, and which were at this epoch in process of formation; and the vegetation, though profuse, was of a description that was flowerless and fruitless. The earth must, therefore, have been ill adapted for the existence and support of any description of air-breathing animal life. The Ferns, Club-mosses, and Equisetaceæ of our own times, which are similar in their nature and properties (though different in species) to the Flora of the Carboniferous age, supply nutriment to few, if any, classes of animals; and accordingly, as might have been expected under such circumstances, the specimens of terrestrial life, which the coal measures and the accompanying strata furnish, present little variety; and such as they are, they rank very low in the scale of organic life. The Insects are chiefly of the Scorpion, Cockroach, Cricket, and Beetle tribes, which could have passed their existences in the midst of a vegetation where fruits had never ripened, and flowers had never blown. Their nourishment, if we may judge from the habits of the creatures of those orders which now surround us, did not require any sustenance beyond that afforded by their fellow-creatures on which they preyed, or the dry unfruitful vegetation which was then in existence. They did not require any of those higher vegetable products which are the support of the higher orders of insect life.

The Batrachian reptile, which was also one of the first occupants of the dry land, belongs to a race of animals which forms a connecting link

between the fish and the true reptile (the Saurian), entering into life in the Icthyic form (tadpole), and passing, at a subsequent stage of its existence, into that of an amphibious animal. The nature of such a creature must have rendered it, in a great measure, independent of both air and vegetation, as some of the class have been known to exist for undefined periods, locked up in clays, and even, it has been said, in solid rocks, where neither air nor nourishment could reach them. They were, therefore, well suited for a life amidst the fruitless vegetation and carbon-loaded atmosphere of the great Coal epoch; and their existence, with that of their humble insect companions, as the first and sole tenants of the dry land of this era, confirms the conclusions of the geologist as to the unproductive nature of the surrounding vegetation; while, on the other hand, the circumstances of the vegetable products exhumed by the geologist, being such as are adapted to co-exist with creatures of that description only, tends to establish the position, also derived from geological evidence, that no higher order of terrestrial animal was then in being.

Such was the state of creation, and such the state of the globe throughout the period represented by the formation of the coal measures, and the accompanying stratified deposits of limestone and ironstone. A hot, hazy, and damp atmosphere rested on a multitude of islands rising from the deep, or on larger tracts of land deeply indented with *shallow bays* and estuaries. Dense forests of

rank vegetation overspread the marshy soil, intersected by rivers, lakes, and swamps, choked with the trailing roots of the huge Stigmaria, and other aquatic and succulent plants; while all around, o'er hill and plain, luxuriant ferns, gigantic reeds, and stately lepidodendra arose, and spread forth their foliage with inconceivable rapidity, until the soft and pulpy stems sank beneath their own weight, and successive forests sprang up from their prostrate and compressed trunks. No sunbeam penetrated the clouds that canopied the misty scene,—no sound disturbed the death-like silence that prevailed, save the rushing descent of falling trees, or the discordant croak of the Batrachian, or an insect's feeble hum—sole living tenants of the land and air. No other beast moved through the deep thickets, and no bird enlivened the dense foliage. Still and sombre was the aspect of our planet, when she thus became the laboratory and storehouse of those vast treasures of coal and iron, which have so materially supplied the wants, and ministered to the comforts and enjoyments of the human race.

THE PERMIAN SYSTEM.

At the close of the Carboniferous formations, violent volcanic disturbances appear to have broken up and dislocated the coal beds to a vast extent: and on the distorted masses another system of sedimentary rocks was deposited. This

system has been denominated the Permian, from the circumstance of its being developed under favourable circumstances, in that part of Russia which was at one time the site of the ancient kingdom of Perm. It consists of different series of strata, which, according to Sir Roderick Murchison, constitute one natural mass. These strata are the Magnesian limestone and a Red Sandstone, which is called the New Red, to distinguish it from the Old Red Sandstone, that preceded and lies beneath the Carboniferous formations.[6] The fossil remains are, generally speaking, a continuation of those of the preceding period, with some exceptions; and most of them, including the great body of the ancient Placoid and Ganoid fishes of the Old Red Sandstone, occur here for the last time. Here, too, the Trilobite, which has accompanied us as a leading and important member of the creation from its dawn, disappears from existence, and is no more found on our planet as a living organism. But the remarkable feature of the system is, that we here find, for the first time, the undoubted traces of the true Reptile, the Saurian, an air-breathing oviparous quadruped,

[6] The strata which compose the Permian, and the Triassic system which succeeds it, were formerly considered as constituting one entire system, to which geologists applied the name of the New Red Sandstone. But as it was found that the fossils of the Magnesian limestone and the Lower Red Sandstone were more closely united to those of the Carboniferous system beneath, than to those of the variegated sandstones which are above, geologists have divided what was the New Red Sandstone *system into two*:—*viz.* the Permian and the Trias.

and also of Birds. These Reptiles, though few in number in the Permian strata, became exceedingly abundant and gigantic in the period represented by the next formations, as we shall presently find.

But besides organic remains, we are furnished, in this system, with other and further proofs of the existence and nature of the creatures that lived and moved upon the land during the period of its formation. We allude to the fossil footsteps imprinted by the animals on the mud and sand which bordered the shores of these ancient seas and rivers, while in a soft state, but which have, since then, become hardened and converted into stone, without obliteration of the impressions —memorials of primeval existences, which have proved more enduring and faithful than the most eloquent inscription on the most lasting monument the art of man could raise.

In the sandstone quarries which have been opened in different parts of the world, and in various formations from the Cambrian and Silurian upwards, we find extensive surfaces of strata marked with the small wavy ridges and furrows that may be seen on every sandy beach which is covered by the flowing and ebbing tides, or at the bottoms of shallow seas; and which are produced by the rippling action of the waves. From these appearances it is obvious, that the sandstones on which they are found, once formed the beaches and bottoms of seas which were under the influence of rising and falling tides and winds, as at the pre-

sent day. In the same places are also frequently found the impressions of rain drops, which must have fallen in the remote ages in which the sandstones were soft sands; and in some instances, the direction in which the rain was driven by the wind is disclosed, by the slanting appearance of the impressions, and the elevation of the rims on one side, as would occur at the present day, under the circumstances of rain drops driven by wind on a sandy beach. Thus, in those days of old, removed from the human era by inconceivably long periods of time, the tides ebbed and flowed, the winds blew, and the rain descended on the earth as now—all the processes of nature, and the divine laws by which the physical universe is regulated, were in full operation, though man, or even the semblance of man, was not. But besides these ripple marks, and the impressions of rain drops, casts of Marine Worms, and footprints of Reptiles and Birds, are distinctly traceable in the strata of the New Red Sandstone of the Permian system.

On the sloping slabs of some sandstone quarries in Scotland belonging to this formation, tracks of some of the creatures which existed while they were in a soft state are plainly visible. They present the appearances of four-footed animals with five claws. "They traverse the rock in directions either up or down, and not across the surface of the strata, which are now inclined at an angle of 38°. On one slate there are twenty-four continuous impressions of feet, forming a regular track, with six

distinct impressions of each foot, the fore foot being differently shaped from the hind foot; the marks of claws are also very distinct."[7] These tracks are supposed to have been made by animals of the tortoise species.

Fossil footsteps of even a more striking character were subsequently discovered in some quarries in Saxony, which are in the same geological strata as the New Red Sandstone of Scotland.[8] The following account of them has been collected from notices by Dr. Hohnbaum and Professor Kemp: "The impressions of feet are partly hollow and partly in relief; all the depressions are upon the *upper* surfaces of slabs of sandstone, whilst the reliefs are only upon the *lower* surfaces, covering those which bear the depressions. These reliefs are natural casts, formed upon the subjunct footsteps as in moulds. On one slab, six feet long by five feet wide, there occur many footsteps of more than one animal, and of various sizes. The larger impressions, which seem to be of the hind foot, are eight inches long and five wide. One was twelve inches long. Near to each large footstep, and at

[7] Bridgewater Treatise, vol. i. p. 261.

[8] Footmarks recently discovered in the Potsdam sandstone, a member of the Silurian, in North America, were supposed by Professor Owen to have been those of a reptile. This conjecture, if true, would have established the existence of terrestrial vertebrates in the Silurian system. But the Professor has, on a further and more careful investigation, decided that the footprints do not belong to animals of the vertebrate class, as he had previously inferred. They probably belong, he thinks, to Crustaceans. *Vide* Quart. Jour. Geol. Soc. vol. viii. p. 80.

the regular distance of a foot and a half before it, is the smaller print of a fore foot, four inches long and three inches wide. These footsteps follow one another in pairs, at intervals of fourteen inches from pair to pair, each pair being in the same line. Both large and small steps have the great toes alternately on the right and left side; each has the print of five toes, and the first, or great, toe is bent inward like a thumb. The fore and hind foot are nearly similar in form, though they differ so greatly in size. On the same slab are other tracks, of smaller and different-shaped feet, armed with nails. Many of these resemble the impressions on the sandstones of Dumfries, and are apparently the steps of Tortoises."[9]

But of still more importance, as regards the object of our inquiries, is the discovery by Professor Hitchcock of Ornithicnites, or the footprints of various species of birds in the New Red Sandstone of the valley of Connecticut in America. These tracts have been found at various depths beneath the actual surface, in quarries of laminated flagstones. "Seven of these tracts occur in three or four quarries within the space of a few rods square; they are so distinct that the Professor considers them to have been made by as many different species, if not genera, of birds. The footsteps appear in regular succession, in the continuous track of an animal in the act of walking or running, with the right and left foot always in their

[9] Bridgewater Treatise, vol. i. p. 264.

relative places. The distance of the intervals between each footstep in the same track is occasionally varied, but to no greater amount than may be explained by the bird having altered its pace. Many tracks of different individuals and different species are often found crossing each other; they are sometimes crowded like impressions of feet on the muddy shores of a stream or pond, where ducks and geese resort."[1]

These footsteps resemble those of Gralla (Waders), or birds of similar habits; the foot of the largest of these birds measured fifteen inches in length, exclusive of the largest claw, which measured two inches. The toes were broad and thick. The distance between the footsteps are from four to six feet, indicating that the length of the leg must have been about seven feet. From these features it has been calculated that this gigantic biped must have been double the size of an ostrich, the largest of our now existing birds, the foot of which is but ten inches, and the length of the leg four feet, and which is nine feet in height, and in weight exceeds one hundred pounds. Next in size are the footsteps of another bird, whose toes were more slender, and measuring in length fifteen or sixteen inches, exclusive of an appendage extending back from the heel eight or nine inches, intended to support a heavy animal walking on a soft bottom. The length of the stride was six feet. It thus appears that the

[1] Bridgewater Treatise, vol. ii. p. 39.

earliest forms of the feathered tribe (and the same observation we shall find applicable to the early Reptiles and Mammals) attained a size far exceeding that of any of the same class which now inhabit the earth: as observed by Hugh Miller, "in the imposing programme of creation it was arranged, as a general rule, that in each of the great divisions of the procession, the magnates should walk first."

"This evidence of footsteps, on which we are here arguing, is one which all mankind appeal to in every condition of society. The thief is identified by the impression which his shoe has left near the scene of his depredations. Captain Parry found the tracks of human feet upon the banks of the stream in Possession Bay, which appeared so fresh that he at first imagined them to have been recently made by some natives: on examination they were distinctly ascertained to be the marks of the shoes of some of his own crew, eleven months before. The frozen condition of the soil had prevented their obliteration. The American savage not only identifies the elk and bison by the impression of their hoofs, but ascertains also the time that has elapsed since each animal had passed. From the camel's track upon the sand, the Arab can determine whether it was heavily or lightly laden, or whether it was lame." [2]

Independent of the interest which naturally attaches to testimony of this nature, these traces

[2] Bridgewater Treatise, vol. i. p. 262,

of birds in the New Red Sandstone of the Permia system are of peculiar importance, as the firs evidence we have of the existence of this class c the created beings. But though their existenc at this period is thus established, no fossil remain of them are to be found in this formation, no until we arrive at the Chalk system, in whic some of their bones have been discovered. Thi evidence, though scanty and faint as to particular is nevertheless satisfactory and conclusive to th extent, that this era witnessed an important ste in the animal creation by the addition of Saurian Reptiles and Birds. Of the former the organi remains are so abundant and well defined in th next succeeding system, that we shall find n difficulty in delineating their natures and habits i the minutest particulars, so as to bring them befor us as they lived and moved in the long period o the world's history that witnessed their reign a monarchs of the creation, the highest class of th creatures that God had then made.

THE TRIAS AND OOLITE SYSTEM.

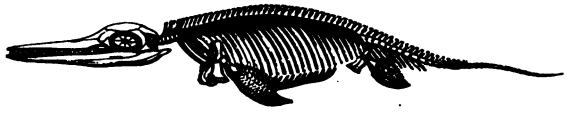
The Permian system, which we have been con sidering, is the close of what has been termed b geologists the Primary or Palæozoic formation, an we now enter on what is known as the Secondar or Mesozoic formation, which commenced with th Trias and Oolite system. The Trias is a depos of shelly limestone and variegated sandstones, rest

ing on the Permian. One of its members, which is wanting in England, is known on the Continent by the name of the Muschelkalk. The Oolite, which lies on it, is also a series of calcareous or limestone beds, the principal of which are composed of a conglomerate, or collection of small round grains or spheroids, which resemble a cluster of small eggs, or the roe of a fish. Hence the name—ὠὸν, an egg, λίθος, a stone. The Lias and Wealden, argillaceous limestones, and well developed in many parts of England, are members of the Oolite; the former at the bottom, and the latter at the top, of the system.

This system is extremely abundant in organic remains, which present us with the forms of the then existing animals of a novel and striking description. These are, for the most part, of the genus Saurian Reptile; which, as we have already seen, made their first appearance in the Permian system, but only attained their full dimensions in number, size, and structure, in this formation, when they enter upon the scene in such multitudes, and so gigantic in their proportions, that it has been termed, "*The Age of Reptiles.*"

Of the Batrachian, which, being the development of a fish (the tadpole), is not classed by naturalists with the true Reptile, some species have been found in the Oolite of extraordinary dimensions, as appears from their organic remains, and their footprints on the rocks. One species of these gigantic frogs must have equalled a large hog in size. But the fossil

remains of the Saurians are still more remarkable, and present almost incredible combinations of form and structure; and from the extraordinary profusion of their organic remains, it is manifest that the seas and shores of the Oolite world must have literally swarmed with these formidable tyrants of the then animal kingdom. They are divisible into three well-defined and distinct classes—the Enaliosauria, or *Marine Saurians;* the Dinosauria, or *Terrestrial Saurians;* and the Pterosauria, or *Winged Saurians.*

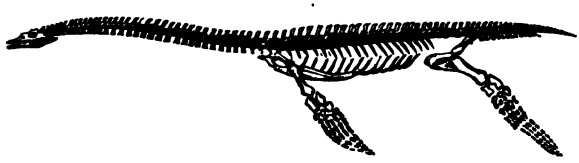


ICTHYOSAURUS.

Of the *Marine Saurians* the principal are the Icthyosaurus and the Plesiosaurus.

The Icthyosaurus, of which there are many species of various form and structure, was an amphibious animal of enormous dimensions, often exceeding thirty feet in length, with a head and teeth resembling those of a crocodile, and eyes as large as a man's head. The peculiar shape of its sternum, or breast-bone, formed like that of the duck-rat of Australia, is conclusive, in the opinion of naturalists, that its nature was such that a continual ascent to the surface to breathe air was necessary to its existence. It was furnished with a huge voracious stomach, and four fins, like the

paddles of a whale. The half-digested remains of fishes and other reptiles which have been found in the stomachs of some of them, and the fæcal remains, commonly called coprolites, attest their ferocious and carnivorous habits; and from the strength of its frame, the keenness of its vision, and the propelling force of its paddles, the Icthyosaurus must have been most formidable and destructive to its contemporaries of the ancient deeps.



PLESIOSAURUS.

The Plesiosaurus was a companion of the Icthyosaurus. It is of this creature that Cuvier has asserted, that the structure is the most heteroclite, and its character altogether the most anomalous and monstrous that have been yet found among the ruins of a former world. "To the head of a lizard, it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent: a trunk and tail having the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale."[3] It was manifestly, like the Icthyosaurus, an air-breathing or amphibious animal; and it has been conjectured by naturalists, that it generally swam upon or near

[3] Bridgewater Treatise, vol. i. p. 208.

the surface of the water, arching back its long neck like a swan, and plunging it downwards at the fishes which happened to pass within its reach, or seizing birds on the wing above it. Several species have been already discovered, some of them attaining the length of eighteen feet. There are many other species of Marine Saurians besides the foregoing—among others, the Cetiosaurus and the Teleosaurus.

Of the *Terrestrial Saurians* there are many genera; but the principal are the Megalosaurus and Iguanodon, a short description of which will be sufficient to illustrate the whole class. From the organic remains of the Megalosaurus, we collect that it must have been a reptile of large and formidable dimensions, measuring from forty to fifty feet in length, and similar in structure and habits to the Crocodile and Monitor of the present day. From the form of the leg and foot we know that it was a land animal, but adapted also to aquatic habits. The structure of its teeth proves it to have been highly carnivorous and destructive.

The Iguanodon was a contemporary of the Saurians which we have been describing; and though much more gigantic than the Megalosaurus, it appears from the character of its teeth, to have been herbivorous only, and therefore comparatively innocent in its nature and habits. The fossil remains prove that it was similar in structure to the Iguanas of our own times, though of far greater dimensions; for while the Iguana

rarely exceeds five feet in length, we know from the organic remains of the Iguanodon, that it attained a length of sixty or seventy feet from its snout to the extremity of its tail. The Hylæosaurus and Steneosaurus also belong to this class of Saurians.

PTERODACTYLE.

We come now to the *Winged Saurians*, or Pterodactyles, which belong to this period, and which differ from both the Marine and Terrestrial Saurians in a very material particular; for while the latter were confined to sea and land, the Pterodactyle was provided with wings, by means of which it could soar through the air. In external form this Saurian resembled a gigantic bat or vampire. But they cannot be classified with the bird, inasmuch as their beaks are armed with teeth like those of reptiles—and from this peculiarity, they must, according to Cuvier, be ranged in the class of Saurians or Lizards. Eight or ten species of this creature have been discovered, varying in size from a snipe to a cormorant. "Most of them had the nose elongated, like the snout of a crocodile, and armed with conical teeth. Their eyes were of enormous size, enabling them to fly by night. From their wings projected fingers, terminated by long hooks, like the curved claw in the thumb of a bat.

These must have formed a powerful paw, wherewith the animal was enabled to creep, or climb, or suspend itself from trees. It is probable also that the Pterodactyles had the power of swimming, which is so common to reptiles."[4] The spread of the wings of some of these strange, dragon-like creatures, has been found to extend to twenty-seven feet; which, when compared with that of the Condor, the largest bird of our era, which does not exceed twelve feet, furnishes us with the means of estimating their gigantic dimensions.

Besides the foregoing, there is another class of Reptiles, whose remains attest them to have been contemporaneous with the Saurians, viz. *Chelonians* or *Tortoises*. Their footsteps are found in the New Red Sandstone; and their organic remains justify the inference, that in some countries the carapace or external shell was about twenty feet in length—thus showing that the whole race of the first-created Reptiles were as gigantic in stature as they were varied in structure and vast in number.

Truly might this be termed "the Age of Reptiles." Great was the army of "the creeping things"—the giant Lizards—in the day of their power. Monarchs and tyrants over all God's then existing creatures, they divided the kingdom among them. Some held dominion over the spreading plains and deep forests—some swayed the sceptre of the aërial regions—while others ruled in the

[4] Bridgewater Treatise, vol. i. p. 224.

oceans, streams, and lakes of the Oolite world with unresisted might.

"Leviathan
And his unwieldy crew, in dreadful sport,
Tempest the loosened brine."

This great abundance of the Reptile race appears, for the first time, in the Lias formation, the lowest member of the Oolite system, though they continue throughout the whole of it, and into the Chalk. But in the Stonesfield Slate, which is a member of the Upper strata of the Oolite, and deposited long subsequent to the Lias, some fossil remains of a small insectivorous animal of the Marsupial family have been found. These Marsupials are considered by naturalists to be a link between the oviparous Reptile and the viviparous Mammal. The Reptile produces its young through the medium of eggs; the Mammal by uterine gestation, nourishing them in the early stages of existence with milk furnished by the mammæ or milk glands; while the Marsupial (of which class are the Kangaroo and Opossum) carries its young, after a brief gestation, in a pouch, where they remain suspended by the mouth to a nipple, until sufficiently matured to come forth to the external air. From this peculiarity, and the inferior condition of the brain, Dr. Buckland infers, "that this order of animal holds an intermediate place between the viviparous and oviparous animals, forming as it were a link between Mammals and Reptiles." The Marsupial, therefore, *holds* the same position with respect to

the Mammal that the Batrachian holds with respect to the true Reptile—the one being a link between the Fish and the Reptile, and the other between the Reptile and the Mammal. And as the Batrachian made its appearance in the Carboniferous era, which preceded "the Age of Reptiles," so the Marsupial will be found to precede "the Age of the Mammals," and may be considered as the herald of the advent of that higher order of the creation which is about to make its appearance in the Tertiary formation.

With respect to the vegetable products of this formation, the fossil flora exhibits a considerable advance in that class of organic life, less profuse in quantity, but of a higher and more useful order than that which characterised the Carboniferous era. At the same time, though greatly diminished, the vegetation was still sufficiently abundant to have formed extensive seams of coal throughout the Oolitic system. Trees of the Palm, Pine, and Cypress species, were mingled with some of the Ferns, Calamites, and Conifers of the Coal epoch. Fruit-bearing plants and flowering shrubs enriched and adorned the thickets wherein the tyrant Megalosaurus waited for his prey, and the more innocent Iguanodon, "biggest born" of the Saurian race, browsed on the foliage of its wide domains.

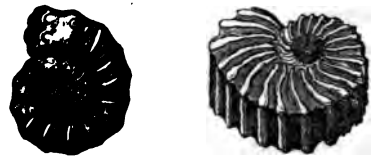
To produce this class of vegetation, more light and a purer atmosphere must have pervaded the earth of the Oolite, than those of the preceding eras. And with the higher orders of vegetation,

we find from the fossil remains, that higher orders of the insect race were associated with them. Butterflies, Ants, Dragon-flies, and flower-fed insects, are found to have existence in abundance, to feed on and enjoy the increasing bounties of Providence—while, on the other hand, new families of insectivorous creatures, such as the Pterodactyles and Marsupials, are introduced with them, to check their increase, and maintain the due proportion which a wise Creator has willed should at all times exist among the various races of animals on the earth. All these products of the Oolite world have passed away. The various species, both animal and vegetable, no longer exist as living organisms; but in their stony remains, we are permitted to study some of those links, of antique type and pattern, in the chain of being that unites the highest with the lowest species of organic life, and both with the omnipresent Author of their existence.

THE CRETACEOUS SYSTEM.

We now arrive at the uppermost and last bed of the Secondary period—the Chalk or Cretaceous system, which was formed by deposit in deep seas. The tracts, therefore, which it occupies constituted, at the time of the formation, the bottom of these seas. It has been satisfactorily established by microscopic investigations, that a large proportion of the substance of the Chalk is composed of organic

matter, calcareous and silicious shells of animals and sea plants, of such inconceivable minuteness that a cubic inch would contain above ten millions of them. Some of these microscopic creatures are still to be found alive in various parts of the globe, Infusoria and Polythalamia. The organic remains of this system are almost entirely marine, consisting of Zoophytes, Mollusks, Crustaceans, Fishes, and Reptiles. The Marine Saurians disappear in this formation, and there is apparently a great diminution of the multitudinous Terrestrial Reptiles of the Oolite system. Fossil remains of Birds have also been here discovered for the first time, though their footprints in the New Red Sandstone announced their existence as far back as the Permian system. The Cycloid and Ctenoid classes of fishes which have ever since been the occupants of our seas, to the exclusion of the more ancient Placoids and Ganoids, which now die out, are found, for the first time, in this formation. Ammonites, too, of various patterns and vast dimen-



AMMONITES.

sions, appear and disappear for ever with this epoch. Here the Secondary or Mesozoic period closes; and

we now approach the Tertiary, which brings us comparatively nearer to our own times, and to the species of animals and vegetation which are the contemporaries and associates of the human race.

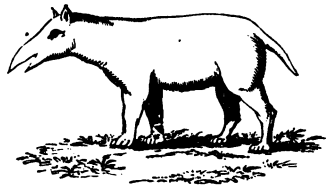
THE TERTIARY SYSTEM.

The Chalk formations were deposited in seas of considerable extent and great depth; but the formations above the Chalk are comparatively limited in extent, being deposits in the hollows of the Chalk beds, which were estuaries and gulfs left at the close of the Cretaceous period. These are denominated the Tertiary formations, and are composed of clay, limestone, marl, sand, and gravel, in which we find organic remains of the animals which occupied the surface of the globe during this era, or more properly speaking, succession of eras. Among other places, the cities of London, Paris, and Brussels have been erected upon basins of these formations; and the contents of these basins and of other similar deposits, which have been brought to light by the labours of the geologist, aided by the ingenuity and skill of the comparative anatomist, show us that the highest order of quadruped Mammals, or Mammifers, had been abundantly brought into existence, *for the first time*, during the Tertiary epoch.

We are now approaching the geology and zoology of the earth as it exists in our own times; and it is with relation to this circumstance, that the *Tertiary system* has been divided into three

eras, viz. The Eocene, or *Lower Tertiary*—The Meiocene, or *Middle Tertiary*—and the Pleiocene or *Upper Tertiary*. To these a fourth is sometimes added, the Pleistocene, or the superficial deposits. The first of these, which represents the lowest layer of deposit, has been denominated the Eocene, as being the dawn of the now existing, or recent races of animals, the contemporaries of the human race —(ἠὼς, dawn, καινὸς, recent). The next division has been termed the Meiocene, because it is a less recent series of strata, and contains the fossil remains of less recent classes of animals (μείων, less) than the Pleiocene, which comes next, and whose name indicates a still more recent period (πλείων, more). And the Pleistocene is so termed, because it is the most recent, approaching the existing state of nature (πλεῖστον, most).[5]

In the *Eocene*, or *Lower Tertiary*, we find the organic remains of an immense number of quadruped Mammifers, many of them belonging to genera now extinct, in the order of Pachydermata, such as the Palæotherium, an animal described as intermediate between, or partaking of the different characters of, the Rhinoceros, the Horse,



PALÆOTHERIUM.

[5] The per-centage of *existing shells* found in these strata are as follows :—

and the Tapir; the Anaplotherium, of which there were several species, and whose organic remains show that they varied in size from a Hare to an Ass—the latter of which it resembled in form, though evidently of aquatic habits; the Cheiropotamus, which resembled a Peccary; and the Adapis, a gigantic Hedgehog.

The *Meiocene* or *Middle Tertiary*, in addition to the foregoing, presents us with the earliest forms of some genera which exist at the present day. In this deposit, we find the remains of the extinct Dinotherium Giganteum, a huge herbivorous animal, which is calculated to have been eighteen feet in length, and was the largest of all the terrestrial Mammifers yet discovered. This creature was, like the Mole species, furnished with organs adapted for grubbing below the surface of the ground, or for tearing up roots and plants on the land, or at the bottom of the water. It was furnished with a trunk like an elephant, and had two enormously long tusks, projecting downwards from the lower jaw, like those of the Walrus, with which, it is conjectured, it attached itself to the banks of rivers, or estuaries, while its body was floating.

In the Pleiocene, we are presented with Mammifers of such vast dimensions, that the period

Pleistocene contains about			95	per cent.	of living species.
Pleiocene	„	„	70	„	„
Meiocene	„	„	25	„	„
Eocene	„	„	3	„	„

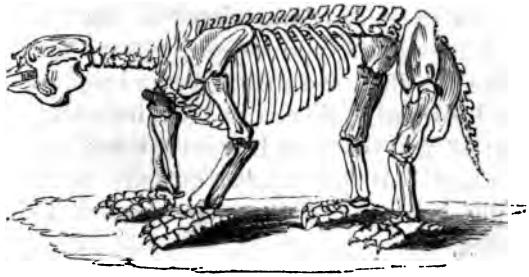
has been termed, "the epoch of gigantic Mammalia;" and, according to Dr. Buckland, "it appears that at this epoch, the whole surface of Europe was densely peopled by various orders of Mammalia; that the members of the Herbivora

DINOTHERIUM.

were maintained in due proportion by the controlling influence of the Carnivora; and that the individuals of every species were constructed in a manner fitting to its own enjoyment of the pleasures of existence, and placing it in due and useful relations to the animal and vegetable kingdoms by which it was surrounded."[4] Here it is that we find the organic remains of these huge members of the Elephantoid family, the Mammoth, Mastodon, Megalonyx, and Megatherium, all of them of truly colossal dimensions, but now represented by animals of comparatively inferior size and strength, such as the Elephant, the Rhinoceros, the Hippopotamus, and the

[4] Bridgewater Treatise, vol. i. p. 95.

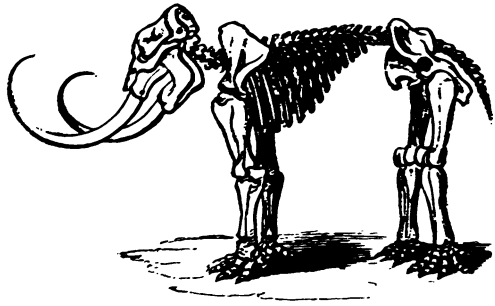
ıth. The dimensions of the Mastodon may be ıjectured, when we state that the lower jaw of ıkeleton of one of those which was found in ı Hudson, is two feet ten inches in length, and ighs sixty-three pounds; and some of the grinder ıth have been known to weigh from seventeen to enty pounds. The Megatherium was an animal



MEGATHERIUM.

the Sloth species. The following graphic deiption will introduce him to the reader: "With ı head and shoulders of a Sloth, it combined, in legs and feet, an admixture of the characters of ı Ant Eater, the Armadillo, and the Clamyorus; it probably also still further resembled the madillo and Clamyphorus, in being cased with bony coat of armour. Its haunches were more ın five feet wide, and its body twelve feet long d eight feet high; its feet were a yard in length, d terminated by most gigantic claws; its tail ıs probably clad in armour, and much larger ın the tail of any other beast among extinct or

living terrestrial Mammalia."[7] The Megalon was also of the Sloth tribe, herbivorous in nature, but of smaller dimensions than the Meg therium. The Mammoth, which appears to ha been the most recent of these colossal trib approaching nearer to the human era than any the others, was a species of Elephant adapt to live in a cold climate, as appears from t remains which have been found in abundance the Arctic regions; more especially from a specim twelve feet high and sixteen feet in length, whi was discovered in Siberia in 1801, imbedded in mass of ice, which had preserved not only t flesh and hide, but a great quantity of the re woolly hair with which the animal had bee covered.



MAMMOTH.

Besides the foregoing, there are vast numbers o species of other terrestrial mammalia — some o

[7] Bridgewater Treatise, vol. i. p. 163.

them extinct, and some still existing, such as tigers, bears, and hyenas—the skeletons of which have been found in abundance in the caverns and fissures of rocks, and which, from the surrounding conditions and circumstances, obviously preceded the existence of the human race. Also Mammals of the air, in the numerous members of the Bat family, which appear for the first time in the Eocene; and Mammals of the sea, in the Whale, Seal, and Morse species; no traces of which are to be found at any previous stage of our earth's existence.

The Tertiary, therefore, is the era of the quadruped Mammals—next to Man, the highest in the order of the animal creation—and no remains of which are to be found in any of the preceding formations, with the exception perhaps of the small semi-reptile Marsupials of the Oolite, which formed a connecting link between them and the pre-existent Saurians. Many of the genera and species of these Mammifers are extinct; the remainder are the contemporaries of the human race. But man has not yet appeared:—

> "There wanted yet the master work, the end
> Of all yet done; a creature who, not prone
> And brute as other creatures, but endued
> With sanctity of reason, might erect
> His stature, and upright with front serene
> Govern the rest, self-knowing."

No fact, in the whole range of geological phenomena, is better established than this, that all

classes and orders of created beings below the rank of Man, with which the earth is furnished, were in existence when Man was not.

> "Air, water, earth,
> By fowl, fish, beast, was flown, was swam, was walked
> Frequent."

All the host of them, from the Zoophyte to the quadruped Mammifer, from the Fucoid to the Forest Tree, lived and moved, enriched and beautified the face of our planet, untold ages before we come to the Alluvium, or superficial accumulations, in which alone are to be found any remains or vestiges of the human race, either their bones or any article of their fabrication.

Nor can the absence of these testimonials of Man's existence be ascribed to any peculiarity of structure or circumstances of life; for it has been well observed by Sir Charles Lyell, that "no inhabitant of the land exposes himself to so many dangers on the waters as man, whether in a savage or a civilised state; and there is no animal, therefore, whose skeleton is so liable to become imbedded in limestone or submarine deposits: nor can it be said that his remains are more perishable than those of other animals; for in ancient fields of battle, as Cuvier has observed, the bones of men have suffered as little decomposition as those of horses which were buried in the same grave. But even if the more solid parts of our species had disappeared, the impres-

sion of their forms would have remained engraven on the rocks, as have the traces of the tenderest leaves of plants, and the soft integuments of many animals. Works of art, moreover, composed of the most indestructible materials, would have outlasted almost all the organic contents of sedimentary rocks. Edifices and even entire cities have, within the times of history, been buried under volcanic ejections, submerged beneath the sea, or engulphed by earthquakes; and had these catastrophes been repeated through an indefinite lapse of ages, the high antiquity of man would have been inscribed in far more legible characters on the framework of the globe, than in the forms of the ancient vegetation which once covered the islands of the Northern Ocean, or of those gigantic reptiles which, at a still later period, peopled the seas and rivers of the northern hemisphere." [8]

Man, then, was the last item of the work of the creation. It is so written in Scripture, and Geology has endorsed the Record as true. A position of such importance to the cause of Bible inspiration has not escaped the repeated assaults of the sceptic; and it has, therefore, been asserted, from time to time, that the fossil remains of the human race have been discovered in strata that proves his existence in some one or other of the older formations. But the attack has always been defeated, either by the skill of the

[8] Lyell's Principles of Geology, p. 147.

anatomist, proving that the organic remains are those of some inferior animal; or by the geologist, showing that the place of deposit was in some of the accumulations of silt, sand, or mud, which belong to the modern era. Thus the fossil remains from the sub-apennine of Œningen, which were described by Scheuchtzer as the skeleton of a man, in a work entitled "*Homo diluvii testis*," were proved by Cuvier, beyond all doubt, to be the fossil remains of an extinct Salamander; and the stony human skeleton which is to be seen in the British Museum, was found, with many others, imbedded in the limestone of Guadaloupe, which is plainly and admittedly a recent deposit, formed by the action of the atmosphere, and streams impregnated with carbonate of lime, or the detritus of coral reefs which surrounded the island.

And here we have again to observe, that with the higher orders of animal life, a higher order of vegetation appears in the view. Step by step they advance with harmony and consistency, proclaiming the constant presence of an allwise superintending Providence. When the submarine Zoophytes, Mollusks, and Crustaceans peopled the depths of the Cambrian and Silurian oceans, no vegetable product was to be found within the precincts of our planet, but Fucoids and Algæ; and in the absence of terrestrial life, nothing more was required. With the lowly zoology,—the Cockroaches, Crickets, and Beetles, the Scorpions and Batrachians of the Old Red Sandstone and Car-

boniferous systems,—we find no higher forms of vegetable life associated than the flowerless and fruitless Ferns, Club-mosses, Equisetaceæ and Conifers, which were sufficient to supply the wants of the then only tenants of the new-born Earth. In the Permian and Oolite worlds, with the herbivorous Saurians, Birds, and the advanced species of insect life, we behold vegetation producing fruits and flowers meet for their nourishment and enjoyment. Down to this period, all the plants appear to have been of the Monocotyledon class, germinating from a single lobed seed. But with the Mammal races of the Tertiaries, a still higher class of vegetation was associated. Here it is that we find, *for the first time*, undoubted traces of the highest class of plants, the Dicotyledon, whose seed is double lobed; and to which belong the Oak, the Beach, the Ash, and other forest trees; together with the grasses and herbs adapted and suitable for the new races of animal life which accompanied their entry on the stage of existence. And it is remarkable, that as we approach the era of Man, we discover, for the first time, traces of the more useful plants, or those which are best suited for his support, and administer most largely to his comfort and enjoyment. At no earlier period are to be found evidences of the existence of the Cereals, which supply his daily bread; and Agassiz has recorded as his opinion, that the order of the Rosaceæ, to which belong the Apple, the Pear, the Plum, and the various fruits of that

description, as well as the Raspberries, Strawberries, Brambleberries, and Roses in all their varieties, were introduced contemporaneously with, or only a short time before, the first appearance of the human race. No traces of them are to be found in any of the lower deposits. The same may be said of the ruminant class of animals, such as the Ox, the Camel, the Deer, and the Sheep. They were better suited to be the associates of the human race than the Saurians of the Oolite and Chalk, or the Pachydermata and giant Mammals of the earlier ages of Tertiaries; and when creation had progressed to their production, their lord and master was sent to have dominion over them.

THE ERA OF SUPERFICIAL DEPOSITS.

We have now, accompanying Time on its slow and stately march, attained the top of the stratified deposits—the platform on which rests the Alluvium which is occupied by the present races of men, animals, and plants; but Geology has furnished us with many facts, which prove that a very considerable period of time must have intervened between the formation of this platform and the creation of man. This period has been termed the Era of Superficial Deposits, during which those accumulations of gravel, clay, sand, marl, peat, coral reefs, &c., which present themselves to the eye all over the surface of the earth, have been formed; and we have reason to know, that, since the commencement of this epoch, great portions of

the continent of Europe, and of our own islands, have been submerged and become the bottoms of seas; while, on the other hand, what had formed the beds of seas, lakes, and rivers, have been in many instances elevated, and now form portions of our dry land.

The surfaces of our continents and islands present us with abundance of evidence of such submergence, and that mighty currents have, since the formation of the Tertiary strata, swept across the face of extensive districts of the present dry land, scooping out deep valleys through the sedimentary rocks, and bearing along with them from great distances huge masses of rocks and boulder stones, supposed to have been imbedded in, and transported with, blocks of ice. Again, beds of now existing species of shells are found in some places hundreds of feet above the level of the ocean, which could not have originated in any other way than by submergence and subsequent elevation, which must have occupied vast periods of time.

But we have a still more striking evidence of the length of time that must have elapsed since our continents and islands assumed their present configurations, in the denudations and erosions which have taken place in the earth's surface above the Tertiary formations. Rocks bordering upon the sea-coast have been worn away by the slow action of the ocean considerable distances, in some places nearly two miles; while rivers have gradually

excavated deep channels or gorges; and waterfalls have eaten down the rocks over which their torrents have been pouring for ages, and have thereby retreated to the distance of many miles from their original position. The far-famed Falls of Niagara, in North America, are an instance of the effect of this eroding power of flowing water on its rocky bed. It is plain to the observer that the river originally flowed in a valley across the whole platform (but some feet higher), from the present site of the falls to Queenstown Heights, where the cataract was, to all appearance, originally situated; and that the river has eaten its way backwards through hard strata of Silurian rocks for a distance of seven miles. Sir Charles Lyell has calculated, from accurate observation and close study of the nature of the rocks and the strength of the eroding power, that 35,000 years, at the least, would have been required for the retreat which the Falls have made by erosion in the manner described.

Professor Hitchcock supplies us with several other instances, in his own country, of what has been effected by erosions of this description. He observes, "The Niagara gorge is only one among a multitude of examples which might be quoted; and some of them far more striking to a geologist. On Oak Orchard Creek and the Genesee River, between Rochester and Lake Ontario, are similar erosions, seven miles long. On the latter river, south of Rochester, we find a cut from Mount Morris to Portage, sometimes 400 feet deep. On

many of our south-western rivers we have what are called caverns or gorges, often 250 feet deep, and several miles long. Near the source of the Missouri River are what are called the Rocky Mountains, where there is a gorge six miles long, and 1200 feet deep. Similar cuts occur in the Colombia river, hundreds of feet deep, through the hard trap rock, for hundreds of miles, between the American Falls and the Dalles. At St. Anthony's Falls, in the Mississippi, that river has worn a passage in limestone seven miles long, which distance the cataract has receded. On the Potomac, ten miles west of Washington, the Great Falls have worn back a passage sixty to sixty-five feet deep, four miles continuously; a greater work, considering the nature of the rock, than has been done by the Niagara. The passage for the Hudson through the Highlands is probably an example of river erosion, as is also that of the Connecticut at Battleboro' and Bellow's Fall. In these places, it can be proved that the river was once at least 700 feet above its present bed. On the Deerfield River, a tributary of the Connecticut, we have a gulf called the Ghor, eight miles long, and several hundred feet deep, cut crosswise through the Mica slate and Gneiss by the stream."[9] The Professor mentions many other analogous cases in different parts of the world, more especially in Eastern climes, all of them evidencing that mighty periods of time must have elapsed

[9] The Religion of Geology, pp. 59, 60.

since the commencement of our present geographical distribution of land and sea; during which these stupendous effects were produced by the slow and gradual processes which we have been describing. Take this period at the lowest limit, and it must have commenced at a time incalculably more distant than what we have reason to know, even independently of Revelation, to have been the dawn of the human era.

But, though long the period which intervened between the formation of the Tertiary deposits and the human era, it is of importance to remark, that the researches of the geologist have proved, beyond doubt, that there has been no interruption in the animal or vegetable creation. Not only has there been no such blank as would require a resort to the theory of a *new creation*, to account for the present existence of an animal and vegetable world, but it is plain that many of the species which existed during the Tertiary formation exist at the present day. Nothing is better established than that the specific forms of many of the now existing terrestrial animals, shells, and plants, are identical with those of the Tertiary period, while others differ so slightly that they may be considered as substantially the same. For instance, the badger of the Meiocene is the same animal in all respects as the badger of our own times; and the same may be said of many other animals, such as the goat, the fox, and the wild cat. We know also, that many of the now

existing reptiles were the contemporaries of extinct Tertiary quadrupeds in India. Again, immense numbers of the shells of Mollusks now inhabiting our seas, are found in positions that prove the existence of the species to have been long prior to that of the human race; and in the same way, many of the trees and plants which now fill our forests, and clothe our plains and hills with their verdure, have been discovered in the Tertiary formations, far below the level of the Alluvium in which are found the first indications of Man and his works.

Going back to the earliest geological ages—to the first moment of physical life upon our planet —the evidence is distinct, that some of the species of each system have lived contemporaneously with some of those of the succeeding systems. For instance, we find the fossil remains of some of the Zoophytes, Mollusks, and Crustaceans, the first tenants of the Silurian ocean, associated in the next strata with those of the Fish of the Devonian, while the latter have been found mingled with the exuviæ of the Reptiles of the Permian, Lias, and Oolite; and animals of those systems are found to have lived contemporaneously with the Mammals of the Tertiaries; and, again, some of those Mammals are found, as we have already stated, in existence to the present hour. These facts establish the proposition, *that no blank or break of continuity has hitherto occurred in the animal kingdom from the beginning:* and that

there is nothing to favour the hypothesis, that there has been, at any time, a death of existing races, and a new birth of those which followed. On the contrary, all the facts of Geology prove that such an event has never occurred.

This will be found of importance, when we come to the consideration of the theory on which Dr. Chalmers, and other eminent Christian inquirers, have built their arguments to prove the consistency of Geology and Scripture. Their systems of interpretation require that life must have been blotted out, and a new series of organic beings have commenced their existence at the date of the human era. But geological facts have taught us, in a language not to be mistaken, that since life was first poured out upon our planet, it has never ceased to flow, without interruption, through the various species of those organic forms which God ordained to be the receptacles of the vitalities in and through which his power, wisdom, and goodness have been disclosed to men and angels. And though the globe on which we dwell has experienced great vicissitudes, and has from time to time been the scene of vast elementary convulsions, it has never been reduced to such a state of lifeless elementary turmoil, as that which is known from Geology to have preceded the Silurian era. Geological history, which communicates the undoubted fact of the surface of our planet having been dark and untenanted, "without form and void," down to the close of

the *Azoic* age, furnishes us with evidence equally satisfactory, that the Almighty has never blotted out or withdrawn his gifts of light and life, so as to necessitate the exercise of a creative power, similar to that which first called them into marvellous being, to account for their present existence.

CHAPTER III.

THE MOSAIC RECORD OF THE CREATIO

"So reads he Nature, whom the lamp of truth
Illuminates. Thy lamp, mysterious word."
Cow

THE Record of the Rocks is now befo and on its stony pages we have traced the progress of the creation of the various ra animals and plants, which have occupied our planet from "the beginning." We have ascended from the era of the lowly Zoophyte, groping in the mud and darkness of the primeval ocean, up to that of lordly Man, surrounded with all the glories and beauties of animated nature, and endowed with an intellect wherewith to understand and appreciate them. We are now in a position to test the accuracy of the written Record—but before we open it, let us pause for a moment to survey the wondrous scene of the creation, which our examination of the Book of Nature has been unfolding to our view.

The first glimpse of our planet presents us with a revolving mass of igneous fluid, wheeling its annual course around the Solar centre of the system, and gradually cooling down by radiation

:o space, whereby a granitic crust is formed on the surface. The gases and vapours, pable of producing water and air, thus con-nsing, the globe becomes enveloped, first with s aqueous, and then with its aërial garment. he whirling mass, encircled with water, expand-g into vapours by the still existing central heat, hibits a chaotic turmoil of gaseous exhalations, id liquid and muddy ejections from beneath, hich, mingled with the detritus and abrasions the primordial granite, form a thick sediment, at, gradually subsiding on the crust below, eposits the first layer of sedimentary rocks. From the circumstance of no fossil remains aving been discovered in the lower section of these bottom rocks, while those immediately above them present us with forms of the lowest types of animal life, we are warranted in our conclusion, that at this period of its history, *no life existed on the globe.* This is succeeded by another aqueous deposit, in which the first specimens of organic life make their appearance in the humble forms of Fucoids, Zoophytes, Mollusks, and Crustaceans; the latter being the highest form of animal organisation during the long period occupied by the formation of the Silurian system of rocks. We are then presented with the next succeeding strata (the Devonian), in which we find a progress of creation in the appearance of Vertebrate Fishes and Land Plants, which are ushered into existence with a burst of volcanic disturbances, by which a

great proportion of our vast mountain chains were thrown up above the expanse of the waters, and present the first tract of dry land. To these succeeded the Carboniferous era, with its first-born of terrestrial animals; Batrachians and insects, and its remarkable Coal measures, attesting an exuberant and gigantic land vegetation; the profusion and extent of which required a prolonged and uninterrupted continuance of *shade, heat, and moisture*, for the production of the peculiar races of plants of which the mineral mass is principally composed. The Permian, Oolite, and Chalk strata succeeded, disclosing an increase in the order, but a diminution in the quantity of vegetation, and a great abundance of the family of air-breathing Reptiles, which in that era swarmed forth from the waters of the earth—the huge Icthyosaurus, Plesiosaurus, and the other vast *Marine Saurians*—the Megalosaurus, Iguanodon, and other members of the *Terrestrial Saurians*—the various species of the Pterodactyles, or *Winged Saurians*—and the varieties of the feathered tribe, which have left their footprints in the petrified mud and sand of the ancient shores, which at this period they frequented. Then follow the formations in which we discern the organic remains of the earliest terrestrial quadruped Mammifers which trod the earth, from the lowly organised Marsupial to the gigantic Megatheria, Mastodons, and Mammoths, that filled the forests, and spread themselves over the plains of

the Tertiary formations. To these succeeded the era of Superficial Accumulations, which present no new creations, until we arrive at the topmost coating of Alluvium, the abode of the human race with their associated animals and plants; where, for the first time, is discovered the evidence of Man's existence, the last and crowning work and masterpiece of creation.

Thus, from the lone and lowly zoophyte, sole tenant of a shoreless, and till then a lifeless, ocean, creation expands, as it were, from a point, upwards and onwards, increasing in extent and perfection like an inverted cone, until we arrive at the broad and well-furnished platform, the habitation of Man; who is there toiling for his existence—eating his bread in the sweat of his brow—but assured by the history of the past, if he regard it, that there is a still higher and more perfect scene to succeed, of which this earth will be the theatre, and of which Revelation has disclosed that he may become a witness and a partaker.

We now open the written Record—the Scripture summary of the events of a creation, which occurred during some portion, at all events, of the long period whose history we have been exploring, comprised between the creation of the material heaven and earth and that of the human race. This narrative occupies the first page of the Revelation to Man of the high destiny which awaits him, and the means by which his title thereto is to be perfected; and without which, he has no

further assurance of an existence beyond the g
than the beasts that perish.

With what trembling awe ought we th
open this Book, for the purpose of comparin
first page with the unerring disclosures of
Book of Nature, which we have been tra
through an undefined series of ages, to whic
era of man is as the rain-drop to the co
shower—it may be, to the ocean itself! If it
not the test of comparison—if it speaks a diff
language, or conveys, as a truth, one fact th
disproved by the writing on the Rocks, sad i
fate of man! With the first page of his tit
life and immortality dishonoured and blotted
what is his claim to any thing in nature's
expanse, but the brief and troublous space tha
between the cradle and the tomb? The triu
of the sceptic is complete; for his doubts, dif
ties, and denials prove that there is no such t
as an instinctive knowledge of immortality;
experience, without revelation, teaches nothin
death without awaking. But, blessed be God
secrets bound up in the Earth, hidden from
sight and knowledge of Moses, and unknow
succeeding generations for thousands of years,
at last come forth into the light of day, n
refute, but to bear witness to his truth and i
ration.

The Mosaic narrative is a detail of the pro
of a creation commenced and completed in
course of what, in Scripture phraseology, is te

six days. The first and preliminary point to be settled before we can approach the interpretation, is the meaning to be attributed to the word "day." It may be used to denote, either a natural day, or a period of time comprising many natural days and nights; and we have it employed in the Bible and elsewhere to convey the latter in some, and the former in other, passages of the same writings. It is, in point of fact, an ordinary mode of expressing indefinite periods of duration in all languages; and Professor Hitchcock has remarked, that even in the latter books of the Bible, when the Hebrew language was much more cultivated, the Jews had no other word to express periods of time. We conceive that, in the Bible narrative of the creation, the term is intended to denote the larger period; and it will be a sufficient justification for our use of it in this extended sense, that we find it similarly employed in this same narrative of the creation, viz. in the fourth verse of the second chapter, "These are the generations of the heavens and of the earth when they were created, *in the day that the Lord God made the earth and the heavens*," &c. In the Book of Job the period of man's life is termed "his day."[1] In other parts of Scripture we have similar expressions, such as, "the *day* of God's wrath," "the *day* of the Lord;" and in the prophecies of Zechariah, "the day of the Lord" is described as "*one day* which shall be known to the Lord, not day, nor night; but it shall come to

[1] Job xiv. 6.

pass, that at *evening time* it shall be light."[2] An indefinite period is here denoted, and it is described as having, like the "day" in Genesis, an evening. Again, the prophet Daniel describes as "the vision of the evening and morning," a period previously described to him as comprising "two thousand and three hundred days." To these, many other instances of the word being used in the extended sense might be added from the Pentateuch.[3] In the prophetical books the instances are still more frequent.

Independent, however, of these considerations, there are circumstances recorded in the Mosaic narrative which are irreconcilably hostile to the interpretation of the Mosaic days being intended to designate natural days. On the sixth day (whatever may have been the extent of time which it occupied), not only were the cattle and beasts of the field brought into existence by their Creator for the first time, but, male and female, created he the progenitors of the human race. Passing into the more expanded history of the events of this day, which are detailed in the second chapter of Genesis, we there find it stated, that after the birth of Adam, and before that of Eve, and intermediate between the two events, the Almighty planted the garden of Eden, and made all the varieties of trees to grow there; and "there he put the man whom

[2] Zech. xiv. 7.

[3] Exod. x. 6; Lev. vii. 35, 36; Numb. vii. 10, 84; Deut. xii. 8; xxxi. 17, 18, 27.

he had formed" "to dress it and to keep it." It is further recorded that He then brought every beast of the field and every bird of the air unto Adam "to see what he would call them;" "and Adam gave names to all cattle and to the fowl of the air, and to every beast of the field." The Creator caused all the living creatures of the earth to pass in review before their lord and master, in such manner that he was enabled to distinguish between, and to designate them by the names which he had bestowed upon them.

Thus, the events which are recorded by Moses as having taken place on the sixth day of the Creation, were, first, the creation of the cattle, beasts, and creeping things of the earth; second, the creation of Adam; third, the plantation and preparation of Eden for the Man whom the Almighty had formed; fourth, the introduction to Adam of the cattle, beasts, and fowls of the air, with which God had furnished the earth in such abundance and variety, and the process of distinguishing them by names, which implies an intimacy of knowledge and accuracy of discrimination that could only have resulted from a personal inspection, that must physically have occupied a considerable extent of time. And, lastly, after all these proceedings, no helpmeet having been found for Adam, God cast him into a deep sleep; and the mysterious formation of Eve completes the work of the sixth day.

Here we have a succession of momentous events,

which involve and require, not only time, but a considerable lapse of time, for their production. The first two events, viz. the creation of the animals of the Mammal race, and of Adam, might have been produced by the miraculous interposition of the Omnipotent Creator in a moment of time, had he thought fit so to exercise his power; but all the other operations necessarily require, not only the element of time, but such an extent of it as would naturally be required for the occurrence of the events which are stated to have taken place—and it would be a physical impossibility, not to be accounted for by a suggested miracle, that a being of human mould could have surveyed with his eyes, comprehend with his mind, and named with mortal tongue, all the beasts of the field and the birds of the air, or even a limited portion of them, within the narrow space of twenty-four hours. A miracle may account for anything that does not involve a contradiction or a physical impossibility. It might call forth from empty space, and in an instant of time, a world of light and life—of beauty and order—and thus account for its existence; but it could not explain how a being of our own nature—endued with a human understanding and human faculties—was enabled, within the compass of a few hours, to inspect and designate by name the various species of the animal creation with which the earth and air abounds. If the use of the term "day" in the extended sense can remove these difficulties, it is manifestly the duty of an

interpreter to give it that meaning which makes the narrative intelligible, and the recorded events consistent with the laws of nature.

There is another view of this question which may tend to elucidate the meaning and import of the Mosaic language. The history of the creation was conveyed to Moses, either by direct inspiration, or, like the generality of divine communications, through the medium of a vision, or series of visions; and comparing the expression, "then evening was, then morning was, one day,"[4] with the somewhat similar expression in the Book of Daniel, "the vision of the evening and the morning," we cannot but see that there is strong ground for the suggestion, that the whole scene was communicated to the sacred historian in a succession of visions, each separate one occupying an evening and a morning, that is to say, an intermediate night, the season of visions or dreams; and the transactions of it appearing to Moses to be comprised in the compass of a natural day, which is defined to be the period of light, though the realities, of which it was the vision, occupied many natural days and nights. It is well known that the transactions of years are often compressed in a dream into the space of a few minutes, or even a less space of time; on the same principle, the operations of the Divine Author

[4] This is the literal and correct translation of the Hebrew passage which has been rendered in our version "the evening and the morning were the first day." In the Septuagint, the expression is "*μία ἡμέρα*;" in the Vulgate, "*dies unus.*"

of the Creation, which may have occupied a long series of years, may have been presented to Moses as the events of a single day. In like manner, the prophet Daniel beheld in the vision of an evening and a morning a series of events which, as detailed, could not have occupied more than a few hours, and yet in reality were to occupy two thousand three hundred prophetic days, which have not in all probability run out their course even to this hour.

An examination of the structure of the narrative will confirm this view; for we find each part of it to be, either an announcement of what God had said, or a description of what Moses had seen. All that is communicated by Moses is, either what was uttered in his hearing, or presented to his sight. We have a report of what God commanded, and what was seen to follow the command—the Heavens, the Earth, the Ocean, the Light, the Clouds raised above the atmosphere, Land vegetation, Sun, Moon, and Stars, Reptiles, Birds, Quadruped Mammifers, and Man. All these could have been brought to the senses of Moses in a vision, but what he could have seen naturally, such as Fishes and other submarine creatures, and Insects, are not, as we shall presently find, mentioned as having been presented to his view, though they undoubtedly formed part of the Creation. This construction of the narrative will reconcile the apparent discrepancy between the word "day," which is defined to be a period of light, and the

expression, "evening was, and morning was," which necessarily comprises the intervening period of darkness.

Long before the question had assumed the importance which the discoveries of Geology have given to it, some of the best informed philologists advocated the opinion, that the Mosaic days were periods of long duration. Among the Jews, Josephus and Philo; and of Christians, Whiston, Des Cartes, and De Luc, have so expressed themselves; while of those who have written at a later period, with a full knowledge of Geological facts, we have Cuvier, Parkinson, Jameson, and Silliman, and, more recently, Hugh Miller—all of them holding the opinion that the Mosaic days of creation *are successive periods of long duration*, being used in the first chapter of Genesis in the same sense in which the word "day" is employed in the fourth verse of the second chapter of the same Book; and which is but a continuation of the narrative of the history of the creation. Augustine observes, "that it is difficult, if not impossible, to conceive what sort of days these were." Moreover, it has been admitted, even by some of those who have construed the Mosaic day as a natural day, that "there is no sound critical or theological objection to the interpretation of the word 'day,' as meaning a long period." This observation of Dr. Buckland, one of the able advocates of the natural day sense of the word, may, of itself, be deemed a sufficient justification for our

interpreting it as intended to convey a lengthened period of time, until we shall have applied the true test of the propriety of such a construction, viz. the adequacy of the interpretation, of which it will form one of the chief elements, to satisfy all the requirements of Geological facts and discoveries —and, further, shown the impossibility of reconciling a creation of six natural days with the same facts and discoveries. But before we leave this subject, it will be necessary to notice briefly a plausible objection which has been brought against our view of the meaning of the Mosaic "day."

It has been urged by the advocates for the natural day sense of the term "day," that the fourth Commandment speaks of the creation as the work of six natural days, otherwise the reason for the sanctification of the Sabbath, as a natural day, is invalidated. But it is obvious to every candid inquirer, that what is intended to be conveyed by the terms of the divine precept is simply, that as God wrought during six successive periods, and rested from his labours on the seventh, so ought man to work in his six natural periods of days, and to rest on the seventh. The distribution of his time ought to be similar to that of the Divine Author of his existence. The allusion to the creation is introduced *by way of illustration or example, and not as conveying a literal truth.* On the other hand, the tenor of this Commandment would appear to furnish a strong argument in favour of the extended sense of the word "day."

For, ever since the creation of Man, God has been resting from his work of creation. It has never been recommenced: and it is remarkable that the expression, "evening was and morning was," which is used to denote the *completion* of each of the first six days, is omitted with respect to the seventh; from which we may reasonably infer, that the seventh day has not yet reached its termination. The seventh day is, therefore, a current period of long duration—something more than a natural day. Consequently, the other six days must, in consistency, be similarly extended.

We have already alluded to the circumstance, that early in the history of Geology as a science, an apprehension prevailed, that the facts disclosed by it were fatal to the truth of the Mosaic Record, as a narrative of the creation. It was alleged, that in the Book of Genesis the age of the world and its occupants had been limited to the human era, a period of about six thousand years, while Geology had taught us that the earth and various races of animals and plants had been in existence countless ages before that time. This was the plausible objection of the sceptic; and the first to encounter it was the famous Dr. Chalmers, who propounded, as his fundamental proposition, that "the writings of Moses do not fix the antiquity of the Globe." His scheme of reconciliation of Scripture with the requirements of Geology was, that between the first act of the creation of the Heaven and the Earth, and the creation of Light with all that

followed it, a vast and undefined period of time may have intervened, during which all the races of animals and plants, whose organic remains are found in the rocks, had lived and died; and that previous to the creation which is recorded by Moses, the light of the sun had been temporarily obscured, and the then existing animal and vegetable creation wholly extinguished in a chaos of death and darkness, which had surrounded and overspread the earth—thus rendering it a scene of wreck and ruin, which may have continued for many ages. He then suggests, that the appearance of light at the Divine command, and the creation recorded by Moses, were realized by a dispersion of this darkness, and a renovation of the Earth by replenishing and refurnishing it with the several races of animals and plants which now adorn its surface—and this work of restoration was completed in a period of six natural days, ending with the creation of Man.

It may be conceded that the language and structure of the Scripture narrative will admit of such a construction; and consequently, if such be the true construction, that, as Dr. Buckland expresses it, "the beginning may have been an epoch at an unmeasured distance, followed by periods of undefined duration, during which all the physical operations disclosed by Geology were going on." It may be, that, consistently with the Mosaic phraseology, "the Earth was" (became), at the close of the epoch, "without form and

void,"—waste and empty, and involved in darkness; but it is scarcely consistent with the Divine economy declared by his works, that such an obliteration of admittedly long previously existing races of animals and plants, as this scheme of interpretation necessitates, should have occurred —and that the Almighty should have restored the Earth by creating new races of similar beings in six natural days. That the Almighty could, in his omnipotence, have performed such a work, is certain; but it would ill accord with that consistency and regularity which all sense and experience show to be his distinguishing attributes. If He occupied ages upon ages, as Geology demonstrates to have been the fact, in his construction of a pre-Adamite world of life and order, has the Christian any right to presume that it was blotted out, and another similar world of life and order created in six natural days, without, at all events, an express revelation that such had been the course of events? The sceptic, with whom this question is to be argued, will not, to uphold the Scripture, admit a doubtful construction of its first passage, which involves the necessity of an extinction of a former world of light and life, and lowers what professes to be a history of the creation to that of a mere miraculous restoration of something that had previously existed, and been for a time blotted out.

Creation is an act of the Deity whereby certain effects are produced; and the Divine mode of

operation for the production of those results have been demonstrated to man, by the pre-Adamite creation, to have been on a determinate plan, and by certain steps or progressive stages, each of which occupied long periods of time. By the pre-Adamite creation, we mean the creation of those animals and plants whose fossil remains have been preserved in the rocks; and these, we know from Geology, were elaborated through an immensely protracted series of ages, beginning with the lowest forms of physical organization, Fucoids and Zoophytes, and progressing with slow and measured steps up the track of time through the higher orders, until we arrive at the quadruped Mammifer. The Fucoid and Zoophyte appeared long ages before land vegetation; and land vegetation many ages before Reptiles; and equally long spaces of time intervened between the first appearance of the Reptile and that of the quadruped Mammifer. We also know from the same source, that after the first acts of creation in each class, the succeeding animals and plants were brought on the stage of existence by the same means or processes as the animals and plants which surround us at the present day, viz. by sexual procreation, and germination of seeds.

This was the system, plan, or order of the Divine Creation of an animal and vegetable world, of the same nature, in all material particulars, as that which now exists—the various species living and growing on the same earth, and moving in

the same ocean as those which now exist, surrounded by the same atmosphere, lightened by the same celestial bodies, and subject to and governed by the same processes of nature—rain, wind, and tides—which prevail at the present day; and yet it is contended, that the animal and vegetable world which now surrounds us, similar in nature and condition to a former one, which, it is alleged, has been blotted out, has been created by Him on a wholly different plan or system, not at the long intervals which marked the pre-Adamite creation, but in the brief span of six natural days. In such a scheme of interpretation of the word and works of the Most High, there is neither religion nor philosophy. God is a God of order. Consistency and regularity are stamped on every particle of his work, and proclaim that such are the distinguishing attributes of the great Architect of the heavens and the earth, and of all that therein is. But this interpretation of his word represents Him as one who pursues different plans, at different times, for the production of similar effects; which, being a departure from the previously declared laws of nature, must be ascribed to a miraculous interference of the Deity, without any warrant, object, or necessity for it.

None have more strenuously deprecated the evocation of miracles to explain a doubtful revelation, than those who have upheld these views of Dr. Chalmers. One of the most able of them,

Dr. Pye Smith, has well, but without much sistency, observed that "the Scriptures dantly show that the Divine Wisdom ha lavished away miracles; but, so far as we has wrought them only for the purpose of diting the claim of some one who professed the bearer of a revelation from God." No of that description can be suggested, in th stance, for a violation of the sacred laws of n the observance of which attests the powe presence of the Almighty with more convict a reflecting mind, than could be effected b breach or suspension of them.

> "To common sense great Nature's course proclaim
> A Deity: when Mankind falls asleep,
> A miracle is sent, as an alarm;
> To wake the world, and prove *Him* o'er again,
> By recent argument, but not more strong.
> Say, which imports more plenitude of power,
> Or Nature's laws to fix, or to repeal?
> To make a sun, or stop his mid career?"

But the position of the learned divine ha encountered and disproved by an argument formidable, perhaps, and conclusive in its than the foregoing. His interpretation wa pounded at a time when Geology was in its i as a science, its facts few, and even tho reduced to the order and arrangement whic now present; but it cannot meet the requir of the science in its advanced state, by wh have been furnished with a fact established dispute by the researches of the practical gist, and which is wholly irreconcilable w

foregoing construction of the Mosaic narrative. The fact to which we allude is one which has been stated before, viz. that between the animal and vegetable existences of the primeval or pre-Adamite world, and those of our own era, *no interruption or blank occurs;* but many of the existing species were contemporaneous with some of those that we know to have become extinct long before Man was created. Many of them, instead of coming into existence a few days before that event, were undoubtedly in existence long ages before; and there is, therefore, no room in Nature's course for any such period of obliteration and darkness as that which the scheme of Dr. Chalmers requires.

This proposition and its consequences are thus stated by Hugh Miller: "It is a great fact, now fully established in the course of geological discovery, that between the plants which, in the present time, cover the earth, and the animals which inhabit it, and the animals and plants of the later extinct creations, there occurred *no break or blank,* but that, on the contrary, many of the existing organisms were contemporary, during the morning of their being, with many of the extinct ones during the evening of theirs. We know further, that not a few of the shells which now live on our coasts, and several even of the wild animals which continue to survive amid our tracts of hill and forest, were in existence many ages ere the human age began. Instead of dating their beginning only a single natural day, or at most two

natural days in advance of Man, they must have preceded him by many thousand years. In fine, in consequence of that comparatively recent extension of geologic fact in the direction of the later systems and formations, through which we are led to know that the present creation was not cut off abruptly from the preceding one, but that, on the contrary, it dove-tailed into it at a thousand different points, we are led also to know, that any scheme of reconciliation which would separate between the recent and the extinct existences by a chaotic gulf of death and darkness, is a scheme which no longer meets the necessities of the case. Though perfectly adequate forty years ago, it has been greatly outgrown by the progress of geological discovery, and is, as I have said, adequate no longer: and it becomes a not unimportant matter to determine the special scheme that would bring into completest harmony the course of creation, as now ascertained by the geologist, and that brief but sublime narrative of its progress which forms a meet introduction in Holy Writ to the history of the human family." And after detailing the evidence in support of this position, he subsequently observes, that, "all the evidence runs counter to the supposition, that immediately before the appearance of Man upon earth there existed a chaotic period which separated the previous from the present creation." [5]

[5] The Two Records. A Lecture, pp. 9, 10, 15, re-published in "The Testimony of the Rocks," which has appeared since the publication of the previous editions of this work.

To avoid this difficulty, the learned Dr. Pye Smith, while adopting generally the interpretation of Dr. Chalmers, suggested that the chaotic period had been limited and confined to one particular portion of the earth's surface, "the part of the world which God was adapting for the dwelling-place of Man, and the animals connected with him." This section of the earth he conceives to have been, "a part of Asia, lying between the Caucasian range, the Caspian Sea, and Tartary, on the north, the Persian and Indian Seas on the south, and the mountain ridges which run, at considerable distances, on the eastern and western flanks. . . . This region was first, by atmospheric and geological causes of previous operation under the will of the Almighty, brought into a condition of superficial ruin, or some kind of general disorder." [6]

This scheme of interpretation, if admissible, leaves to the geologist his unbroken series of animals and plants, except in that small portion of the globe which was the scene of the alleged chaotic visitation, and subsequent restoration. So far it meets the foregoing objection, but it is open to all the other objections alleged against the scheme of Dr. Chalmers, besides many more peculiar to itself, and to which such a narrow view of the revealed plan of the Creation is plainly obnoxious. On these we need not dwell; for the construction contended for is obviously inconsistent and irreconcilable with the Scripture language.

[6] Geology and Scripture, pp. 250, 251, 5th ed.

How read we?—"In the beginning God crea
the Heaven and THE EARTH." This manife
and admittedly comprises *the whole globe*. "A
THE EARTH was (became) without form and voi
How can the same term, "the Earth," in t
latter sentence be confined to a part, and a v
small part, of the Earth's surface? And y
Dr. Smith's interpretation requires that it shou
Even if such a construction be received by t
indulgent Christian, anxious to preserve uni
peached his greatest earthly treasure, how can
be brought to bear on the Sceptic, whose objectio
we are bound to answer? He will not permit th
different meanings should be assigned to the sam
word in two consecutive sentences of a communica
tion, which, if divine, must be accurate, witho
any apparent warrant, or necessity, for such an
unusual construction, beyond the necessity arising
from the circumstance, that without it his objections
must remain unanswered.

But if these interpretations are to be abandoned
as no longer tenable, how, it may be asked, are we
to uphold in its truth and integrity the Scripture
record? To this all-important question, the reply
is, that we must return to the simple construction
of the Mosaic Record, as a narrative of the general
plan of the Creation from the beginning down to
the close of the work—a position from which those
champions of the Bible retreated, but which they
would never have thought of abandoning, except
under a misapprehension that it was not tenable

in their encounter with geological facts. The supposed difficulty, under pressure of which they then retired, and resorted to the interpretations which we have been discussing, is succinctly stated by Dr. Buckland. After observing that it had been asserted that the order of succession of the organic remains of a former world accords with the order of creation recorded in Genesis, he continues,—"This assertion, though to a certain degree apparently correct, is not entirely supported by geological facts; since it appears that the most ancient marine animals occur in the same division of the lowest transition strata with the earliest remains of vegetables; so that the evidence of organic remains, as far as it goes, shows the origin of plants and animals to have been contemporaneous; *if any creation of plants preceded that of animals,* no evidence of such an event has yet been discovered by the researches of Geology." [7] The same difficulty is thus presented by another able and intelligent advocate for the natural day interpretation, "Genesis declares vegetables to have been created on the third day, *and no animals until the fifth;* but we do not find vegetable remains without animal remains in any of the great formations, ancient or modern." [8]

The difficulties thus suggested as hostile to an adherence to what is obviously the natural construction and tenor of the Mosaic narrative, are

[7] Bridgewater Treatise, vol. i. p. 17.
[8] Geology and Religion, p. 102.

founded on a misapprehension of the purport of its language. We shall find, as we proceed with our inquiries, that it is a misconstruction of the words of Moses, to say that "the creation of plants preceded that of animals," as stated by Dr. Buckland; or that "no animals were created until the fifth day," as alleged by Dr. King. On the contrary, we hope to be able to show distinctly, that the order of creation recorded in Genesis is accurately in accordance with the order of the organic remains, both of animals and land plants, as disclosed by Geology—that, according to Moses, some animals were created before, some contemporaneous with, and some after the creation of land vegetation; and that this order of creation is confirmed and ratified by the discoveries of the Geologist.

Should these propositions be established, the Christian inquirer will have no difficulty in adopting that reading of the written Record of the Creation, which must recommend itself to every candid and unprejudiced mind, as admitted by one of the foregoing writers, who, but for the difficulty which he has suggested, would have preferred the more simple and obvious construction of the Mosaic narrative which we are advocating. He observes, "The first chapter of Genesis, when explained of the making and peopling of the world at large, has, no doubt, a peculiar fitness and grandeur; and if the language of Scripture, and the facts of Science, were found to admit of this inter-

ion, it would be preferred to others."[9] The
ıge of Scripture and the facts of Science will,
ıst, appear in the following pages, to be not
y reconcilable, *but in perfect harmony and*
ı; and that which presented the appearance
crepancy between them, and veiled the truth
those seeking it, will be shown to have arisen,
from a misinterpretation of the language of
ı, and partly from a misapprehension of geo-
l facts.

gh Miller, in a recent work,[1] has adopted the
of the six days being lengthened periods, and
atural days, and has endeavoured, on that
hesis, to reconcile the Scripture and Geologic
ds; but he professes that, as a geologist,
only called on to account for three of the six
or periods of the creation, inasmuch as geolo-
systems and formations regard the remains
three great periods of Plants, Reptiles, and
nals, *and those only*. He therefore accounts
e periods of the third, the fifth, and the sixth
and shows that the sequence of Plants, Rep-
ınd Mammals are the same in the Mosaic
eological Records; but with respect to the
ı,—viz. the period of the first day, during
light was created,—the period of the second
during which the firmament was made to
the waters below from the waters above it,—
ıe period of the fourth day, when the heavenly

[9] Geology and Religion, p. 103.
[1] The Two Records. A Lecture, p. 18.

bodies became visible from the earth's surface,—he observes, that of them, *we need expect to find no record in the rocks;* and accordingly he leaves untouched and unexplained those portions of the Mosaic narrative. We propose to proceed further, and to show that Geology furnishes us with facts that confirm and corroborate the truth of every statement in the Record of Moses, from the beginning down to the creation of Man—the original state of the Globe without form and void—the first dawn of light, the formation of the firmament, and the separation between the waters below and the waters above it—and the first appearance of the Sun, Moon, and Stars on the fourth day, intermediate between the creation of the vegetable world on the third day, and the creation of the Creeping things and Birds on the fifth day. This will supply what is wanting to complete the harmony of the two Records; and will furnish the believer with evidence of divine inspiration that must confound and silence the Sceptic, and establish and authenticate, not only the Mosaic narrative, but, through it, the whole canon of Scripture.

CHAPTER IV.

THE TWO RECORDS COMPARED.

"Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

SHAKESPEARE.

THE Mosaic Record of the Creation, which we are now about to examine, whether of Divine or human origin, purports to be a narrative of events of which our planet was the theatre at some period between its first formation and the birth of Adam. It may be, that it is an epitome of all the vicissitudes and changes which have occupied the vast space of time which intervened between "the beginning" and the completion of the work of Creation; or it may be, that it is a detail of the events that occurred during the short period of the six concluding natural days. The former is confessedly the most natural and appropriate interpretation, if the facts of Geology will admit of such a construction; though the latter has been more generally adopted, through what we shall prove to have been a misapprehension regarding the inconsistency of Geological phenomena with the Scripture narrative. But whether it be the history of the whole period of the pre-Adamite world, or only

of its six closing days, the Mosaic narrative is Record of all that is pre-eminently ancient—and only that, but is itself the most ancient bool written Record in the world. This is a fact ceded by the infidel; for Porphyry, the most termined and formidable of all the antago which Revelation has had to encounter, ad after patient research, that Sanchoniathan was most ancient of profane authors, and that his ings contain copious extracts from the Bool Moses. It must also be admitted, that in plicity and dignity of language and structure opening scene of the Creation has never been passed by any of the writings, sacred or pro which have succeeded it. Our present task establish its comprehensiveness, truth, and racy, as a description of the general plan and tem of Creation from "the beginning," or firs mation of the Heaven and the Earth, down to of Man.

"In the beginning God created the Heaven an Earth. And the earth was without form and void darkness was upon the face of the deep."

This opening passage of the written Record closes to us that there was a beginning, a Creator of the Heaven and of the Earth, o material globe on which we dwell; but it af us no direct information as to the time of the mencement of the Creation. From geologica astronomical discoveries, however, we learn

almost inconceivable series of ages must have passed away since the Heaven, including the heavenly host of Sun, Moon, and Stars, and the terrestrial Globe, were ushered into existence.

The light of the most distant cosmical body in the realms of space, offers us the most sensible evidence of the existence of that body. Therefore, as it has been calculated by Herschel, that the light of the most remote of the nebulæ, discovered by his forty-foot reflector, travelling at the rate of 200,000 miles in a second of time, must have occupied the duration of two millions of years on its way to the earth, the creation of that nebula, one of the heavenly host, must be of that antiquity at the least; for the object must have been in existence in the sidereal heavens, in order to send out those rays by which it is now perceived by the inhabitants of our planet. How much longer it may have existed, or how many more of such bodies are in existence, whose lights have not yet reached the earth, it is impossible to conjecture.

Again, the period which must have elapsed since the first sedimentary rocks began to be deposited on their granite base, is the shortest date that can be suggested of the Earth's existence; and calculating the time occupied by the deposition of the whole series of sedimentary rocks, upwards of fifteen miles in thickness, by our experience of the rate of progress of such an operation in the superficial accumulations which

surround us, four or five millions of years
have elapsed since the commencement of the
mation of the first stratified rocks. This
course, only an approximation, and a very u
tain one, to the date of the Earth's existenc
we have no means of ascertaining, with any d
of exactness, the rate of these sedimentary a
tions in the primeval ages. But still it
approximation, and affords some evidence of
earth's antiquity; for while there may have
circumstances causing the deposit of the
mentary strata to accumulate more rapidly at
periods, there may have been circumstances u
which they were accumulated more slowl
others. Therefore, whether we ascend to
heavenly region, or descend into the earth
information and instruction, we learn that mil
of years must, in all probability, have passed
since the Heaven and the Earth issued from
hands of their Creator, to become a theatre fo
manifestation of his wisdom, power, and good

Still, however remote it may have been, we
from Geology, in confirmation of Scripture,
there was *a beginning*, when the universe was fo
out of its gaseous elements; and the first pi
of our planet, after its entry on the stage
existence, disclosed by the written Record, is
it was "without form and void, and darkness
upon the face of the deep." The more co
rendering of the original Hebrew text (וְ וָבֹהוּ)
is, that the earth was *invisible and unfurn*

"ἀόρατος καὶ ἀκατασκεύαστος," as expressed in the Septuagint version—*invisible*, inasmuch as it was covered with water, or vapour, and enveloped in the darkness that was on the face of the deep,—and *unfurnished*, inasmuch as no organic forms of plants and animals had yet been called into being. Wrapped, then, in its watery garment, and enveloped in thick darkness, without a living creature of the animal or vegetable world within its precincts—a *dark untenanted watery waste*—is the simple condition of our planet when introduced to our notice in the Book of Moses. Let us now turn to the Book of Nature, and inquire to what extent it corroborates the foregoing picture.

First—Geology has taught us that there was a time, far away in the remotest of the remote ages of the pre-Adamite world, when the first series of the sedimentary or stratified rocks were deposited on the primordial granite; and during the long period of the formation of the first, or Azoic formation, there is every reason to believe that the waters of the deep were spread over the whole surface of the globe, from the circumstance of these rocks being found in nearly every accessible part of it; inasmuch as in that case, the seas in which they were deposited must have been co-extensive with the rocks themselves. We have already seen [1] that there is nothing in geological phenomena to contradict this fact, but, on the contrary, everything to render it probable, that down to the close

[1] *Ante*, pp. 56—58.

of the Silurian system, at which time we find the *first traces of fossil remains of land vegetation*, that waters prevailed everywhere, and that

> "Over all the face of Earth
> Main ocean flowed."

Secondly—As to *the darkness* which is stated to have rested on the face of the deep, it is not to be expected that the rocks then deposited, or any other now existing matter, could be of much assistance to us in confirming that fact. Nevertheless, a consideration of the actual state of the material world at that period, coupled with the nature of the bottom or Azoic rocks, will be found to aid us in our endeavour to confirm even that statement of Holy Writ. The principal ingredient of these bottom rocks is evidently mud, mixed in its earliest stages with the detritus of granite; and we have already seen that the granite crust of the earth was formed by the gradual cooling down of the molten mass of terrestrial matter, so that when the first strata of these bottom rocks were being laid down on this crust, the strong internal heat must have kept the watery surface which was spread over it, in a continued state of evaporation; and in the absence of an atmosphere, which was not created till the second day, such evaporation would take place even at a very low temperature. The vapour of this boiling ocean, mingled with the gaseous exhalations emitted from the heated earth, and the torrents of mud out of which the

bottom rocks were then being formed, must have spread a canopy of darkness over the face of the deep as long as the chaotic turmoil was in action. By the gradual cooling down of the earth's crust, the muddy vapour must have subsided, until at last it became sufficiently pellucid for the admission of light. Till then, all must have been darkness on the surface of our planet.

Thirdly—At and previous to this period the earth was *unfurnished with physical* life; for it appears, from the investigations of the geologist, that notwithstanding the most diligent search in every part of the globe, no fossil remains of animal or plant are to be found in the Azoic rocks, or in the igneous base of granite on which they rest; and therefore (though the evidence is only negative in its nature) we are warranted in the conclusion, as a corroboration of Scripture, that no animal lived, and no vegetation grew, on the face of our planet, previous to, or during the formation of, the bottom or Azoic system of rocks.

It has been urged, that animal life *may* have existed during the period of the deposition of the metamorphic rocks, though all trace of their existence may have been obliterated by the intense heat to which these strata were manifestly subjected. But it is scarcely necessary to remark, that an hypothesis that life may have existed, without evidence of the fact that it did actually exist, could not be entertained as a disproof of the statement of Moses that no animal life was then in existence. Thus,

we have every reason to conclude, that after the creation of the Heaven and the Earth, the Earth was for a time *covered with water—invisible*, having its surface veiled from the admission of light, and darkness on the face of the deep—and *unfurnished* with aught of animal or vegetable life; and that it continued in that state, "without form and void," during the long period of the formation of the Azoic or lowest portion of the stratified rocks. So far the Book of Nature confirms the written Record.

"AND THE SPIRIT OF GOD MOVED UPON THE FACE OF THE WATERS."

This passage, which does not appear to have particularly attracted the attention of commentators, we shall find to be of the utmost importance, as a key to elucidate the harmony that will be found to exist between Scripture and Geology. It has been construed by some as a statement that a mighty wind had moved over the face of the waters.[2] But as there could be no wind when there was no atmosphere, and as the atmosphere was not in existence until the second day of the creation, this interpretation cannot be sustained. It has also been construed as an announcement merely of the presence of the Spirit of the Deity. But a statement of the mere presence of the Omnipresent with that which He had created, such as "on the face of the waters," would be unmeaning

[2] On this interpretation Calvin remarks, "Adeo frigidum est, ut nullâ refutatione indigeat."

sensible, and not at all in accordance with
ıal economical precision of the divine histo-
anguage. What the Creator had created,
ıst have been present with. This passage
ıerefore have been intended to convey some-
nore specific—some special operation of the
Spirit on the waters with which He had
ed the earth.

erto we have nothing on the scene of the
ı but mere inorganic matter. But no com-
ı of inorganic matter could produce organic
'his announcement of the moving of God's
ɔn the waters must, therefore, we conceive,
ıded to convey the first act of the creation
:he pouring of vitality into the waters; and
he Spirit of God moved or *brooded* (as the
r word ought to be translated) on the face
waters, the first created living animals
into existence.[3] Nor is this construction
Scripture warrant; for we find the Psalm-
reference to various animals of the earth
, which he had been enumerating, stating,
takest away their breath, they die, and

rding to Gesenius, the word מְרַחֶפֶת, which is trans-
ur version "moved," comes from "רָחַף, to be moved
tion (Piel), to brood over young ones, to cherish young
;le—Deut. xxxii. 11—figuratively used of the Spirit of
brooded over the shapeless mass of the earth, *cherish-
ivifying*." The true meaning, therefore, of the passage
ɔn would appear to be, that the Spirit of God brooded
. vivified, the till then lifeless mass of waters that
ınd the globe.

return to the dust. Thou *sendest forth thy Spirit, they are created:* and thou renewest the face of the earth."[4] We likewise find in Ezekiel's vision of the valley of dry bones, that the vivification of the lifeless forms is ascribed to the presence of the πνεῦμα, or Spirit. The sinews and flesh came upon the dry bones, which is a picture of organization *without life;* and the Spirit of God moved over the mass, and *they lived.* In the Book of Job, we also find, "by his Spirit he hath garnished the heavens,"[5] and "the Spirit of God hath made me."[6] Theodoret seems to have taken the same view of the meaning of this passage, τίσι δοκεῖ τὸ πανάγιον πνεῦμα ζωογονουν τῶν ὑδάτων φύσιν,[7] i. e. "Quibusdam videtur fuisse Spiritum Sanctum qui vivificabat et fœcundabat aquarum naturam." We are not, therefore, without warrant, in construing the announcement that "the Spirit of God moved on the face of the waters," as intended to convey that God had commenced his work of *impregnating the waters with life;* and if so, the first created of living creatures must have been *wholly submarine.* It was on the waters that the Creator's Spirit moved, or brooded; and it is, therefore, in the primeval waters that the first created being with life is to be sought for. If these views are correct, then, according to Scripture, no land has yet appeared above the surface of the universal ocean—no ray of

[4] Ps. civ. 29, 30. See also Ps. xxxiii. 6.
[5] Job xxvi. 13.
[6] Job xxxiii. 4.
[7] Quæst. viii. p. 13, ed. Halens.

light has yet reached the globe—but there existed some species of submarine organic life. Is this picture realized by the facts of Geology? Let us consult the Record of the rocks.

Passing upwards from the metamorphic, or Azoic section of the Cambrian rocks, which testify that the Earth was till then "without form and void," invisible, and unfurnished with life or light, we arrive at the upper section of the same rocks, in which the Oldhamia Zoophyte, and some other obscure specimens of animal life, have been discovered; and thence at the Silurian system, which succeeded, in point of time, and was deposited on, the Cambrian strata; and in these two systems are found the first traces of the fossil remains of organic life, Zoophytes, Mollusks, Crustaceans, and Fucoids,[8]—all of them specimens of *exclusively submarine beings*. In these classes are comprehended the whole population of the Cambrian and Silurian ages. But it is of importance to our present inquiries, that we should ascertain, as far as practicable, the order of their existence, that is to say, of their creation.

It is obvious that the creatures whose fossil remains are found in the lowest beds of the stratified rocks, were the first that existed on the face of our planet. It was, until a recent period, supposed that there were no such remains to be detected in any of the strata below the Silurian—that the lowest zone of animal life was there situate—and

[8] *Ante*, p. 55.

that the underlying Cambrian was wholly unfossiliferous. But, of late, the industrious research of the geologist has brought to light, as we have already seen,[9] several proofs of animated beings having existed during the deposition of some of the Cambrian rocks. No fossil remains, however, of plant or animal have been discovered in the metamorphic rocks which are at the foundation, and rest immediately on the granite; and, indeed, it is not easy to conceive how life in any known form could have existed on our planet during their deposition. Their crystalline texture, betokening the presence of intense heat, and the strange curvatures and contortions of the Gneiss and Mica-Schist strata, reveal scenes of excitement and turbulence in those early geologic periods, which are wholly incompatible with the existence of any species of organic life. But leaving these localities of chaotic turmoil, and ascending a little higher, we catch the first glimpses of vitality in the overlying schists, grits, and clay slates of the Cambrian system, which were deposited in comparatively cool and peaceable seas; and here we meet with the Oldhamia, a Zoophyte of a type which approaches nearer to a plant in appearance than an animal, associated with some annelides of equally limited senses, in the Brayhead rocks, a member of the Cambrians; and in the Longmynd rocks of North Wales, of the same formation, the remains of an organism supposed to be a new genus of the

[9] *Ante*, p. 56.

Trilobite family, and some other obscure indications of animal or vegetable life have been detected.[1] But, on the whole, the specimens of organic life throughout the extended period represented by the great mass of the Cambrian rocks, are scanty and indistinct; and such as we might expect to find them, if life had commenced with the lowest and progressed to the higher, more perfect, and more abundant organisms, which make their appearance as we ascend the steps of creation.

In the Silurian system, the same orders of animated beings, but better defined, and in greater abundance, present themselves; the earliest of which, in the Silurians of North Wales, are, according to Sir Roderick Murchison, the Graptolite, a Zoophyte, and the Lingula, a flat Bivalve, resembling in form a diminutive cockle, or muscle; and which is known, from the horny nature of its shell, to have been the inhabitant of a muddy sea-bottom that contained little or no lime, or calcareous matter, to supply the fabric of a more perfect shell. The rocks in which these fossil remains have been found, are styled by Sir Roderick Murchison "mudstones," from the nature of the deposit of which they were evidently formed. Such are the earliest fossil remains which are found in the Silurian rocks of North Wales; and the lowest band of the same system presents similar organic remains in Norway, Sweden, Russia, Bohemia; in the Skiddaw slates of Cumberland and Westmoreland; and in the Potsdam Sandstones of North

[1] Vide *ante*, p. 44.

America—in short, in all places in which this system of rocks is found. Difference of latitude presents no such corresponding differences of species, as we find to have occurred, since the decrease of central heat and the consequent variation of climates, in later periods of the world's history.

Such was the zoology of the earliest era of animal life with which we are acquainted: and it must be admitted that it is vain to expect to be able to determine by direct observation, the genus of the first created being that was endued with life upon our globe. Nevertheless, the researches of the geologist have supplied information sufficient to establish, with reasonable certainty, that as the Zoophyte occupies the lowest place in the scale of organization, so it ranks highest in the antiquity of its birth. The whole analogy of the progress of creative power establishes this fact, and assures us that the first of created beings, animated with the principle of life, could not have been higher in the scale of physical organization than the *sightless* Zoophyte. Geological evidence has established beyond question, that the invertebrates were as a class in existence before any member of the vertebrate order of animals. The Zoophyte, Mollusk, and Crustacean occupied the globe ages before any vertebrate creature had entered on the scene. It also establishes that the order of the existence of the vertebrate began with the lowest of the class, the Fish; that the Fish was succeeded by the next in order, the Reptile; which, in its turn, was *succeeded* by the Mammal; and that the Mammal

was followed by Man, the highest of all in the ascending scale of physical organization. The progress of vertebrate existence has, therefore, been gradual from the lower to the higher class of being. As we ascend the steps of creation from the Old Red Sandstone, the abode of the first vertebrate, to the top of the Tertiaries, we at the same time ascend, at each stage, with undeviating regularity, from the inferior to the superior races of animals; and thus arrive, with well-founded assurance, at the law of progress which the Creator has imposed upon himself in his work of furnishing our earthly abode with its successive inhabitants.

Returning now to the era of the invertebrates, with the view of applying this principle, we find groups of Zoophytes, Mollusks, and Crustaceans, mingled together throughout the Silurian and part of the Cambrian formations, becoming scarce and more scarce—few and far between—as we descend in the rocks towards the beginning of our mundane history, until they disappear altogether. In our investigations, we pass, as it were, from light to twilight, and from twilight into mist and darkness, so that it is impossible to predict with certainty, at any step of our descent, that we have arrived at the abode of the first-born of the vitalities of the creation; but it would be an inversion of the divine law of the Creator, as manifested in the progressive creation of the *vertebrate* kingdom, if it were to be assumed, as regards *invertebrates*, that the first created being had been a Mollusk or a Crustacean,

instead of a Zoophyte; even though a Mollusk or a Crustacean should be found at the lowest depth of animal life which has yet been attained by inquiring man. The geologist who reads the genealogy of the family of vertebrate creatures on the stony tables of nature, must know, by analogy, our only safe and legitimate guide in such a case, that there is a lower depth of invertebrate life beyond his ken, where the Zoophyte, or some creature of inferior organisation, is to be found, though as yet he sees them not. And thus, though a Crustacean may perchance be found beside or below the *earliest known* Zoophyte, we may rest assured that the birth of the Crustacean was preceded by that of some other undiscovered Zoophyte, whose organs of sense were as limited as those of the Oldhamia or Graptolite. Should the presence, therefore, of a highly organised Trilobite, in association with the Oldhamia and Graptolite, or the lowest zone of animal life, be established beyond question, the fact would by no means displace the position, founded on the well-ascertained law of progress in creation, that the Zoophyte was the elder-born to the more highly-organised Crustacean, in the family of the invertebrates.

Thus, though direct evidence may be wanting, we have sure ground for assuming, that in the procession of life some creatures of the Zoophyte order were in existence before any other species of living organisms; and were, therefore, the earliest created beings—heralds of a world of life.

The only senses with which the Zoophyte, or even a headless Bivalve, could have been endowed, were those of touch, taste, or smell. It could not be contended that they were furnished with the organs of *sight or hearing*—in point of fact, they were devoid of both. But as we rise in the Silurian strata, advancing in time up the steps of creation, we are presented with submarine animals of higher classes of organisation, and endowed with those higher organs of perception.[2] We find, for instance, the Trilobite, the most remarkable Crustacean of the Silurian epoch, whose eye presents us with an optical instrument, formed on the most accurate dioptric principles, for the perception and enjoyment of light by animals of that form and condition. The Cephalopod, also, was furnished with organs of vision and hearing. But the first created Zoophytes and Bivalve Mollusks, not having been furnished with any such organs, we are warranted in concluding that they were ushered into existence before that the divine fiat had gone forth for the appearance of light on our planet, to terminate

[2] "All Turbinated and simple shells (Univalves) are constructed by Mollusks of a higher order than the Conchifers, which construct Bivalves; the *former have heads and eyes;* the Conchifers, or constructors of Bivalves, are without either of these important parts, and possess but a low degree of any other sense than *touch and taste.* Thus, the Mollusk which occupies a Whelk or a Limpet shell is an animal of a higher order than the Conchifer enclosed between the two valves of a Muscle or an Oyster shell."—*Buckland's Bridgewater Treatise,* vol. i. p. 296.

the reign of darkness upon the face of the deep. Had the earliest created animals been furnished with organs fitted for the perception of light, no reasoning mind could adopt the proposition that they were in existence when and where no light could reach them. The mutual adaptation of light to the eye, and of the eye to light, is so obvious, that in all our investigations of the relations of the animal and physical worlds, we naturally conceive that the existence of the one necessarily implies that of the other; and therefore, the absence of the visual organs in the earliest created animals, is another corroboration of the Mosaic narrative, that "the Spirit of God moved on the face of the waters," and infused them with life, before that light had been permitted to penetrate into their depths.

Such being the nature of the submarine animal creation, it is clear, that while some of them might have been, and in all probability were, created before light was admitted to the surface of the globe, others of higher organisation, and furnished with organs of sight, were not created until after the admission of light into the ocean's depths—and there is nothing in the Mosaic narrative at all inconsistent with such a state of facts. The creative Spirit of God moving in the waters, may, consistently with the Scripture record, have continued, not only during the first day, or era of the creation, but during the second and also the third, as we shall presently find was the true state of the case.

So that while light was being introduced upon the earth, and while the firmament, or atmosphere (the work of the second day), was in course of formation, and even when the land vegetation was in progress of creation on the third day, the Spirit of God was introducing into the waters new forms of aquatic life—first, Zoophytes and Bivalve Mollusks of a low organisation—secondly, the higher classes of submarine invertebrates, such as the Crustaceans and Mollusks of the Cephalopod family — and thirdly, the still higher classes of Vertebrate Fishes. Geology establishes these facts; and the Mosaic Record is in perfect harmony with them.

It has been generally supposed that the submarine animals formed part of the work of the fifth day of the creation. It would follow, therefore, if that supposition be well founded, that their introduction in this section of the Mosaic narrative, is not only unnecessary, but inconsistent with the text of Scripture. But it will appear, when we come to the consideration of the work performed by the Almighty on the fifth day, that this class of aquatic creatures is not included among those which, we are told, came into existence at that period. That creation was, we shall find, of a *wholly different order of animals;* and, therefore, if the creation of the submarine invertebrates is not included in the descriptive language of "the Spirit of God moving on the face of the waters," no notice of their creation will be found in any part of the Mosaic narrative.

There is, moreover, a plain reason, which we learn from Geology, for this somewhat indirect mode of announcing the submarine creation, so as not to be confined to any one of the days, or eras, of creation—and that is, that the organic remains of the Cambrian, Silurian, and Devonian strata show that the existence of submarine animals may have commenced, and, in all probability, did commence, before the dawning of light on the deep, and was, we know, continued subsequent to that event; and that some of the species, viz. Fishes, were not in existence until the commencement of the work of the third day. There are, in fact, three classes of submarine animals: first, Zoophytes and Bivalve Mollusks, without visual organs; and which, therefore, *may have existed before light*—second, the higher classes of Mollusks and Crustaceans, furnished with organs of sight; and which must have come into existence *after the creation of light*—and third, the still higher class of Vertebrate Fishes. The first class was created on the first day before the dawn of light — the next, on the second day, after the appearance of light—and the last, we know to have come into existence contemporaneously with land vegetation, viz. on the third day of the creation. So that the creation of this portion of the animal world must have extended through three at least of the Mosaic days, and could not, therefore, consistently with truth and accuracy, have been announced as a separate item of creation

confined to any one of them; and had the Mosaic record declared that the submarine animals were created on the first, or on any single day of the creation, it must have been contradicted by Geology. But, as expressed, there is no contradiction between what has been written and what has been brought to light by the Geologist. According to both, the Spirit of God moved on the waters on the first day; but when He ceased to produce submarine animals is not stated in Scripture, nor established by Geology. How beautifully, then, do the facts of Geology illustrate the language and structure of the inspired Record! And we may with truth add, that no mode of expression could more appropriately convey the true state of the facts disclosed by the records of the Rocks, than that which has been used by the inspired penman. This will appear even more clearly as we proceed.

There is a further, and, as it appears to us, most satisfactory reason for the form of expression which has been adopted by Moses in this place, and for the structure of this portion of his narrative. The scene of the creation was, as we have already suggested, in all probability communicated to the divine historian through the medium of a vision; and if so, he could only have recorded or described what had met his eye, or was communicated to his ear; and, accordingly, he records that part of the creation which he saw or heard, and not that part of it which he could not have seen, or did not hear. He therefore announces the divine fiats which he

heard, and the consequent dawn of light—the formation of the atmosphere lifting up the clouds—and the appearance of dry land and vegetation, all of which he saw—omitting that which he could not have seen, viz. the submarine animals; and only announcing with respect to them, what may have been communicated to his senses, as to Ezekiel in the vision of the valley of dry bones, that the Spirit (πνεῦμα) of God was moving on the waters, breathing life into them.

Thus, then, is the Scripture picture realized by Geological facts. Organic life before light—the creative Spirit of God moving on the still darkened waters—and no symptom of dry land. The work of furnishing the Globe with life has commenced; but hitherto, as both Geology and Scripture testify, water pervades the whole surface of it; and its sole occupants are Fucoids, Zoophytes, and Bivalve Mollusks, and, it may be, some other submarine creatures of equally low organisation and limited senses.

It is manifest, therefore, that our planet, previous to the first dawn of light recorded in Scripture, was not in the state of wreck and ruin of a former world of life and being described by Chalmers and Buckland. It was not, then, as they have suggested, a vast cemetery of *extinguished races of plants and animals;* but may with more propriety, be described as the dark womb in which the embryo of a world of life was beginning to move. Since the Heaven and the

arth issued from the hands of their Creator, ntold ages, represented by the formation of the ranite crust on the molten mass, and the depo- tion of many thousands of feet of the bottom ocks, have rolled away, before that the dark epths of the primeval waters are stirred by the itality of the lowly Fucoid or humble Zoophyte; nd untold ages are yet to elapse, before that a eing of intellect and responsibility shall visit the cene. Slow and gradual is the progress upwards rough the intermediate classes of the animal reation: but every moment will be fully occupied 1 the work of adapting the earth to be a fit habi- ıtion for the human race; and which may thus e said to have been in preparation for them om the foundation of the world.

We are now, as Scripture teaches, and Geology onfirms, on the confines of the living world. ehind us all is void and empty, and at our feet scanty race of Zoophytes, and Bivalve Mollusks, ıe lowest items in the scale of created beings; ısignificant in the eyes of man, but of vast nportance at the period of their existence, and eeply interesting as the first organic forms in hich the mystery of life was developed on our lanet. But no ray of light has yet reached ıe surface of the globe. The black pall of an nbroken night still invests—

> "The world of waters dark and deep
> Won from the void and formless infinite."

But the fiat of the Almighty went forth,—

"AND GOD SAID, LET THERE BE LIGHT, AND THERE WAS LIGHT. AND GOD SAW THE LIGHT THAT IT WAS GOOD: AND GOD DIVIDED THE LIGHT FROM THE DARKNESS. AND GOD CALLED THE LIGHT DAY, AND THE DARKNESS HE CALLED NIGHT. THEN EVENING WAS THEN MORNING WAS, ONE DAY."[3]

This divine command, and the result of it, does not negative the previous existence of light as a part of the original creation, or as one of the primitive qualities of the Sun and others of the heavenly bodies. It only conveys the information that light was commanded to shine, where, we are told, darkness had been resting till then, that is to say, on the waters which encompassed the Earth. "Darkness was upon the face of the deep; and God said, Let there be light," *to dispel that darkness.* The Sun had sent forth his rays from the date of the creation, but the black misty envelope of the deep could not be penetrated until the divine fiat went forth for the advent of light to its surface. The opaque gaseous vapours that were circling round the earth, while the mud of which

[3] This is the correct translation of the Hebrew original. The expression יוֹם אֶחָד does not signify "the first day," as it has been rendered in our version, but "one day." In the 8th verse the expression יוֹם שֵׁנִי, by reason of the absence of the definite article הַ, ought to be translated "a second day." The same observation applies to the several announcements of the third, fourth, and fifth days, in each of which the definite article is wanting, and the proper translation is, therefore, "a third day," "a fourth day," "a fifth day." But in the announcement of the completion of the sixth day, in the 31st verse, the article הַ renders the expression יוֹם הַשִּׁשִּׁי definite; and, therefore, it is properly translated "the sixth day."

the bottom rocks was formed was in progress of deposition, had subsided, and light could penetrate the waters; and that it did penetrate the depths through a pellucid medium, during the formation of the Silurian system (though not in its earliest stages), is manifest from the organs of vision with which a great proportion, though not the first born, of the animals of that period were furnished. This is the simple confirmation of the Scripture text, "Let there be light;" for light which now exists, must have existed when the Trilobites and other Crustaceans of the Silurian system were in being; while, on the other hand, there is no necessity for its previous existence, the creatures which then existed having been devoid of organs of sight.

But though *Light*, the fairest portion of the creation, and without which no part of it could be fair, had reached the earth, it was not poured forth on it in its fulness at once. As regards our planet, its creation was *progressive;* and ages elapsed before a direct ray revealed the forms of the Sun and other celestial bodies to an earthly eye. At first, it had to struggle through the aqueous vapours which rested on the waters before the creation of the firmament, or atmosphere. It was afterwards more evenly diffused by the intervention of the cloud-capped atmosphere, which came into existence on the second day of the creation. Behind the clouds the Sun remained throughout the second and third days, or eras, of Creation; and on the fourth, the Heavenly host

became, for the first time, visible to an eye situate on the Earth's surface. Such is the Scripture pic ture; vapours resting on the ocean on the first da of Creation, before they were lifted up by th atmosphere—unbroken clouds spread above th atmosphere throughout the second and third days and withdrawn only on the fourth day, when th direct rays of the Sun poured their full effulgenc on the earth. Under these circumstances, ligl must have been progressive; and the time whic elapsed between the first and the fourth days Creation, may be compared to the slow dawn of long morning, from the pale glimmer of approacl ing light to the bright sunshine of a cloudless sk Strange as the proposition may appear, yet it wi be found to be true, that the contents of the rock confirm and establish every line and letter of th Scripture revelation; and we shall prove, as w proceed, not only that such *may* have been, b that such *must* have been, the plan and course the Creation.

With the first dawn of light, and the consequei division between light and darkness—day ar night—on the globe, the first day, or era, of tl Creation, terminates—"then evening was the morning was, one day." This era commenc with the creation of the Heaven and the Eart invisible and unfurnished, enveloped in darkne and devoid of either animal or vegetable existenc and it did not terminate until it had witnessed tl commencement of animal life, and the introdu

tion of light upon the globe. Its continuance was from "the beginning" throughout the long ages wherein the Cambrian rocks, in which are found the first glimmerings of organic life—the Spirit of God moving on the face of the waters—were, grain by grain, and layer by layer, raised by deposit from the granite bed of the ancient ocean, to the height of nearly five miles, and until after the deposit of the earliest strata of the Silurian system, in which are found the higher orders of Mollusks and Crustaceans, furnished with the organs of sight and hearing, and thus adapted for the enjoyment of light and an atmosphere.

But beside the liquid ocean which was wrapped around our globe, it has yet to be enveloped in its other ambient covering, the aërial atmosphere, necessary for the respiration of the various races of the animal and vegetable world, which are to be introduced in the process of furnishing it with the glories and beauties of animated nature; and necessary also, for the diffusion of light and transmission of sound. This is the work of

THE SECOND DAY.

"AND GOD SAID, LET THERE BE A FIRMAMENT IN THE MIDST OF THE WATERS, AND LET IT DIVIDE THE WATERS FROM THE WATERS. AND GOD MADE THE FIRMAMENT, AND DIVIDED THE WATERS WHICH WERE UNDER THE FIRMAMENT FROM THE WATERS WHICH WERE ABOVE THE FIRMAMENT: AND IT WAS SO. AND GOD CALLED THE FIRMAMENT HEAVEN. AND EVENING WAS AND MORNING WAS, A SECOND DAY."[4]

[4] *Ante*, p. 166, n.

The literal meaning of the Hebrew word, which is here translated "firmament," is "expansion;" and, as appears by the context, it is intended to describe, what we denominate, "the atmosphere," and for which there is no other corresponding term in the Hebrew language; for it is the atmosphere alone which divides the waters below from those which are bound up in the clouds above. The face of the globe was, at the commencement of this day's work, still covered with water, which was in a continual state of evaporation, by reason of the high terrestrial temperature, arising from the central heat; and after reaching a certain elevation, where, by removal from the earth, it entered into a cooler region, it became condensed, and was again precipitated, by the earth's attraction, on the face of the waters from which it had arisen. In this state of things, the introduction of an elastic atmosphere of the nature of that which now embraces the earth, would have the effect of upholding the aqueous vapours in masses of clouds, which would occasionally pour down their contents on the face of the waters below. There would therefore be, as long as the high temperature of the earth continued, a constantly ascending vapour, or steam, forming itself into masses of clouds, and streaming down from time to time in tepid showers. Such a canopy of cloud would effectually exclude the direct rays of the Sun from the earth, and render the surface of it a vast humid hothouse, eminently calculated

for the production of an extensive and luxuriant vegetation. This is what the Book of Nature teaches us, and it is in perfect consistency with the Mosaic description of the firmament dividing the waters below from those above.[5]

The period of the third day of the Creation, during which the elastic fluid of an atmosphere was in progress of formation, was that in which the greater part of the Silurian system of rocks was deposited; and the organization of the creatures which we know to have then come into existence, such as the various classes of Trilobites, Cephalopods, and other Crustaceans and Mollusks, similar in their general structure and habits to many of the present day, is strong evidence that the water and atmosphere in which they dwelt could not have differed essentially, in nature and composition, from the water and atmosphere encompassing the Crustaceans and Mollusks which are the contemporaries of the human race. An atmosphere, or "firmament," must therefore have been then in existence, or in process of formation. It had, no doubt, a greater proportion of Carbon in its composition than the air of more recent times; but it was sufficiently pellucid for the transmission of light, and sufficiently elastic to uphold the clouds.

[5] It is probable that the belts of the planet Jupiter are masses of unbroken clouds, produced, and still continued, under similar circumstances to those that formed and sustained the clouds which shut out the direct rays of the Sun and other heavenly bodies from the surface of our own planet, throughout the first three days, or eras, of the creation.

So far the Book of Nature confirms the Book of Genesis. We shall find further corroboration as we proceed through the contents of the succeeding formations.

We are now, according to Genesis, at the close of the second day of the Creation, and according to Geology, at or near the close of the Silurian system. If we have rightly interpreted the former, the world that was dark, and "without form and void," is now decked with light, clothed with an atmosphere, and furnished with submarine animals; and if the Geologist has rightly read the stony leaves of the Book of Nature, our planet, at the close of the Silurian epoch, was inhabited by a population wholly submarine, and which must have required both light and air for its existence.

Here terminates the aqueous or watery era of the Globe. Its duration, though coeval with the long ages occupied by the deposition of the vast rocks of the Cambrian and Silurian strata, may nevertheless be termed the youth of our planet; and throughout that period, from "the beginning," no island rose from the bottom of the shoreless ocean, whose tides and billows circled the globe, and swept without a breach from pole to pole. Nothing met the divine historian's eye, and nothing has been chronicled by his pen, but water below and clouds above, with dim diurnal light and nocturnal darkness alternately pervading all. Living creatures were beneath the

surface of the deep, but could not have formed part of the divine vision. "His way was in the sea, and his path in the great waters, and his footsteps were not known." They are therefore undescribed and unrecorded by Moses, further than what may be implied from his announcement that "the Spirit of God moved on the face of the waters."

Thus far, the revelations of Scripture and the facts of Geology coincide, without a shadow of variance. The geographical extent of the Cambrian and Silurian rocks, and the absence of the fossil remains of *terrestrial* plants and animals throughout, are strong testimonies to the truth of the revelation that land has not yet emerged from the deep. But that event is near at hand: and dry land, or the earth, with all the eternities of weal and woe involved in that word, is, for the first time, about to appear amid the world of waters, to become the stage of progressive creation.

THE THIRD DAY.

"AND GOD SAID, LET THE WATERS UNDER THE HEAVEN BE GATHERED TOGETHER UNTO ONE PLACE, AND LET THE DRY LAND APPEAR: AND IT WAS SO. AND GOD CALLED THE DRY LAND EARTH; AND THE GATHERING TOGETHER OF THE WATERS CALLED HE SEAS; AND GOD SAW THAT IT WAS GOOD. AND GOD SAID, LET THE EARTH BRING FORTH GRASS, THE HERB YIELDING SEED, AND THE FRUIT TREE YIELDING FRUIT AFTER HIS KIND, WHOSE SEED IS IN ITSELF, UPON THE EARTH: AND IT WAS SO. AND THE EARTH BROUGHT FORTH GRASS, AND HERB YIELDING SEED AFTER HIS KIND, AND THE TREE YIELDING FRUIT, WHOSE SEED WAS IN ITSELF, AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD. AND EVENING WAS AND MORNING WAS, A THIRD DAY."

The Scripture narrative of the work which was performed by the Almighty on this day of the Creation is simple and unequivocal—the formation or appearance of dry land above the wide expanse of the waters, and the creation of land vegetation to grow and propagate itself upon the surface. Such being the declaration of the Divine Record, let us now read the testimony of Geology.

First, as to the formation of the dry land. We are now at the closing scene of the Silurian, and near the commencement of the Devonian, or Old Red Sandstone system; and all Geologists concur in the fact, that from the appearances which these formations present, this period must have been one of extraordinary volcanic disturbances. According to Hugh Miller, the Devonian epoch was ushered in with elementary tumults, which he assimilates to the uproarious opening scene of Shakespeare's "Tempest;" and, without doubt, many of the principal mountain chains in the world were then upheaved. This is not conjecture, as we have stated before,[6] but founded on evidence of the most satisfactory and conclusive nature. The position of the Silurian strata on the sloping sides of these mountains demonstrates to the practical Geologist, that the exact period of their elevations was at the close of the Silurian system, and when the deposits of the Devonian were about to commence; and

[6] *Ante*, p 61, n.

these phenomena are sufficient and adequate to account for the upheaval of dry land above the surface of the waters. Moses does not describe how the land was made to appear. He merely states the result of the Creator's command,—"And it was so." He saw earth where waters had previously prevailed, and does not state how the phenomenon was effected. But such elevations by volcanic protrusion, are obviously the only conceivable mode by which continents and islands could be made to appear on an expanse of ocean such as then overspread the face of the globe,

> "The mountains huge appear
> Emergent, and their broad bare backs upheave
> Into the clouds."

Not less satisfactory, as a confirmation to a reasoning mind, of this having been the date of the first appearance of the dry land, is the fact of the entire absence of any trace of land vegetation in any of the previous formations, and the undoubted evidence of their presence in the earliest stages of this, as we shall now proceed to show.

Secondly, the testimony of Geology with respect to the origin or first appearance of land vegetation is distinct, and confirmatory of the Scripture record of its creation. It has been already stated, on the high authority of Sir Roderick Murchison, that the first appearance of land plants was at the very top of the Silurian Rocks, where the Old Red

Sandstone rests upon them. He further states, "that there are no traces of land plants in the great mass of the Silurian rocks; and it is only where the uppermost strata unite with the Devonian that certain traces of land plants have been sparingly detected. Even in the Devonian rocks such plants are rare, and only begin to prevail as we pass upwards, and are surrounded by the spoils of the first great woody era" (the Carboniferous).[7] This is evidence of the highest value, and above suspicion; and nothing can be more distinct and conclusive as to the fact of *land plants having appeared, for the first time*, at the close of the Silurian and commencement of the Devonian or Old Red Sandstone era—at first, scanty and lowly, but increasing in number, size, and extent, until they expanded into the luxuriant vegetation, out of which the great coal deposits were formed. So far, all is harmony between the Record of Moses and the Record of Geology. Not only is there no inconsistency or variance between them, but the one is confirmed in every particular by the other; and as we proceed upwards and onwards in tracing the contents of the two Records, they will be found to correspond with astonishing accuracy at every step.

According to the Mosaic narrative, a great and extensive revolution in the physical world took place on the third day, or era, of the Creation. Earth, the future abode of the air-breathing tribes

[7] Siluria, p. 267.

of animals, including the human race, began its existence in the midst of what had been till then a world of waters. But from Geology we learn—what is not, and ought not to have formed, part of the Mosaic narrative—that an equally important addition was, at the same period, made to the animal world, by the creation of the first species of Vertebrates (which is the model or type on which Man was afterwards framed), in the form of Fishes. Hitherto the invertebrate Crustacean, a creature without a bony skeleton or brain, was the highest in the class of living beings—the masterpiece of God's workmanship, and the monarch of his mundane Creation. But, with land and land vegetation, Fishes appeared for the first time, as the researches of Sir Roderick Murchison have fully established. Crustaceans and other submarine invertebrates continue to exist; but their sovereignty has departed, and the superior class of Vertebrate Fishes reign in their stead. Long ages must wax and wane before a creature of higher organisation shall appear, to dispute their supremacy and dominion; and, during that period, the Earth will be clothed with those extensive and gigantic forests which characterise the Carboniferous era, the geological phenomena of which will largely contribute to the establishment of the truth and inspiration of the divine historian, and fill up the Scripture outline of the Creation; so as to present a complete and perfect picture of the power, wisdom, and goodness of the Almighty in

his work of preparing the Earth for the succeeding classes of the animal and vegetable world.

But before we appeal to these geological facts, to ratify and realize the Mosaic picture of God's work on the fourth day of the Creation, a few observations on some well-established principles connected with the nature and effect of the rays of sunlight on the vegetation of trees and plants, will be found to afford considerable assistance to our identification of the Scripture record with the revelations of Geology. The science of the Sunbeam, the most impalpable and evanescent of created existences, will aid us as much in the vindication of the truth of God's word, as the science of the Rocks, the most imperishable and unchanging of earthly substances.

In every sunbeam that reaches the earth, there is a combination of three distinct principles, which are known by the names of Light, Heat, and Actinism. *Light*, or the luminous principle, is that which is the cause of the varied hues and colours which greet our vision in every part of the universe. *Heat*, or the calorific principle, is that which regulates temperature, and excites motion throughout the world. And *Actinism* is a chemical principle, which quickens life in the plant, and is productive of other molecular changes in various substances.

These principles, though combined in each ray, are nevertheless separable by certain mechanical contrivances from each other; and the effect of the

sunbeam on earthly substances depends entirely on the proportions in which they are respectively present in it. Thus, by the exclusion or diminution of the luminous principle, a considerable change takes place in the efficacy of the Actinic principle; and it is found by experiment, that the germination of seeds and the growth of plants are more rapid and prolific under the influence of the Actinic, when separated from the Luminous principle, than would be the case were they under the influence of their combined radiations. It is remarkable, however, that though, under such circumstances, a more rapid and luxuriant growth is exhibited, the plant, instead of solidifying, remains soft and succulent. Woody tissue will scarcely be formed at all, if the plant is deprived of the Luminous, and subjected to the influence of the Actinic and Calorific principles alone. It is the unclouded sunbeam which consolidates the fibres of the plant, and forms it into a hard woody substance. Every day's observation will to some extent confirm this; for the plants that spring up beneath the shade of trees, screened from the direct rays of the sun, are rank and pulpy, while the same species of plant growing up in the open air is firm and healthy, though less advanced in size and slower in growth. The direct rays of the sun are, in point of fact, desolatory and inimical to vegetation; and therefore the circumstances best adapted for the production of a quick and profuse, though soft and succulent, vegetation, are those in

which the plant is screened from the direct rays of the sun, and surrounded with heat and moisture.

In such a position, the plant has but little power to decompose the Carbonic acid, which is the operation by which woody tissue is formed. Carbon is the food of the plant, and is as necessary for its existence and strength, as Oxygen is for the existence and support of animal life. This Carbon is extracted from the surrounding atmosphere, in which it is mingled with Oxygen and other gases; and during the daylight, the plant is constantly engaged in inhaling the Carbonic acid gas (a combination of Carbon and Oxygen) which is in the air, and exhaling the Oxygen arising from its decomposition. But in the absence of light, this process of decomposition cannot be carried on, as it is wholly dependent on the excitement of light. During the night, the process is almost, if not wholly, suspended; but with the morning dawn, the plant begins to imbibe the Carbonic acid, which it has a power of decomposing, so as to retain the Carbon to build up its own woody structure, while it dismisses the Oxygen into the air for the nourishment of animals, whose health and strength, and, we may add, existence, is thus dependent on that of the vegetable creation in combination with the light of the sun. In shaded or clouded situations, the activity of this process of decomposition, which is suspended, as we have seen, during the night, diminishes in proportion as the rays of the sun are excluded.

The green colour of the leaves of plants is derived from a compound called Chlorophyle, which forms in their cells, and in which there is a very large proportion of Carbon. The formation of this compound is wholly dependent on the influence of the rays of light, and is only produced by their presence. Plants which grow in the dark have no colour; and an anecdote in the "Gardener's Magazine" will illustrate the dependence of the formation of Chlorophyle, and, consequently, of the decomposion of the Carbonic acid, on the influence of the direct rays of the Sun. It often happens in the extensive forests of America, that the clouds will, for many days in succession, interrupt the direct rays of the Sun; and in a particular district the Sun was, on one occasion, obscured in this manner for the space of twenty days, during which time the leaves of the trees, under the combined influence of heat and moisture, were developed rapidly so as to attain their full size. Having thus expanded in the absence of a sufficiency of the luminous principle of the sunbeam, the Chlorophyle was not produced, and the leaves presented a pale whitish appearance, very unlike their natural verdant hue, until at length the Sun burst through the clouds, and poured its brilliancy upon the foliage of the trees. The effect was, that the formation of Chlorophyle instantly commenced, and before the Sun had reached its meridian, the pallid foliage had disappeared, and the forest was once more clad in its

wonted garb of green. Had the Sun continued behind the canopy of clouds for a longer period, the formation of the Chlorophyle, and the consequent decomposition of the Carbonic acid, would have been proportionably suspended. Extending this principle to large tracts of land, covered with vegetation of this description, situate in a warm and damp climate, and shaded by dense unbroken clouds, the result would be, that while the vegetation increased rapidly, the atmosphere would continue to be poisoned with an undue proportion of Carbon, and remain an unfit habitation for air-breathing animals.

Thus it is obvious, that the unclouded rays of the Sun are absolutely necessary for the production of hard woody tissue; and every tree of that description, when cut transversely, presents a series of concentric rings, varying in thickness, each of which represents the quantity of sunbeam which has fallen upon it during each succeeding summer: the ring of wood is produced by the influence of the sunbeam, and therefore indicates its extent in each season. These rings are called season rings, as they are successively formed in successive seasons. From this it follows, that in the absence of sunshine, as no hard wood could be formed, no season rings would appear in the sections of the tree; and further, that when the season rings are found, we may rest assured that the direct sunbeam has reached the plant, and that summer and winter have alternated at the period of its growth.

From these observations, we may deduce the following propositions, which may be considered as well-established truths. First, that the circumstances best adapted for the rapid and profuse growth of vegetation, are those in which there is an exclusion of the direct rays of the Sun, and the presence of heat and moisture; but that the vegetation produced under such circumstances will be soft and succulent, and present no traces of season rings. Secondly, that such circumstances are inimical to the extraction of Carbon by the growing vegetation from the atmosphere; and would therefore prove highly prejudicial to the existence of terrestrial air-breathing animals.

It is a corollary to these propositions, that if in any district, and during a particular period, the vegetation is luxuriant and profuse in quantity, and soft and succulent in its nature or quality, we may rest assured that the direct ray of the Sun has been a stranger to that region, during the growth of such a vegetation. And if we further find, that in the same district, and at a subsequent period, the vegetation is hard and woody in its texture, and that it presents the season rings, we may be certain that the unimpeded sunbeam has visited that district during that period, and that there have been alternations of summer heat and winter cold. We may add, that these distinctions of climatal conditions, during the foregoing periods, will be confirmed, if we find that air-breathing animals were not in

existence during the former, but were in existence during the latter, of those periods.

Let us now return to our two Records. We have passed through the era of the Devonian or Old Red Sandstone formation, which, as we learn from Geology, was ushered in with violent volcanic eruptions, by which vast mountain masses were upheaved. In this manner dry land appeared, and was clothed by the power and goodness of a beneficent Creator with vegetation, which has continued from thence throughout all subsequent ages, for the use of the various races of animals with which the Earth has from time to time been furnished. From the same source of information we also know, that the creative Spirit of God continued to move in the waters; and while He was clothing the new-born earth with vegetation, he was pouring into the seas the higher forms of submarine life, vertebrate fishes.

Passing upwards from the Old Red Sandstone, we now enter on that interesting and all-important period which witnessed the formation of the great Coal fields, the produce of a vegetation that has never been paralleled, even in the most favourably situated soils and climates of the world. That these vast and widely-diffused coal measures have been formed of vegetable matter is, as we before observed, an admitted fact, established beyond dispute by the direct and unerring testimony of the senses; but how, or under what circumstances, the Earth of that era came to be clothed

with such a gigantic and extensive vegetation, the Geologist has given no satisfactory explanation. His Record is silent on the subject. But the written Record of Moses will be found to afford important aid in unfolding one of the mysteries of this primeval era.

The Carboniferous epoch, or that in which this abundance of vegetable matter arose from, and then descended into, the Earth, is that of

THE FOURTH DAY,

at the close of which, according to Moses, the heavenly host of Sun, Moon, and Stars were unveiled, and became, for the first time, visible objects from the surface of the Globe.

"AND GOD SAID, LET THERE BE LIGHTS IN THE FIRMAMENT OF THE HEAVEN TO DIVIDE THE DAY FROM THE NIGHT: AND LET THEM BE FOR SIGNS, AND FOR SEASONS, AND FOR DAYS, AND YEARS: AND LET THEM BE FOR LIGHTS IN THE FIRMAMENT OF THE HEAVEN TO GIVE LIGHT UPON THE EARTH: AND IT WAS SO. AND GOD MADE TWO GREAT LIGHTS; THE GREATER LIGHT TO RULE THE DAY, AND THE LESSER LIGHT TO RULE THE NIGHT: HE MADE THE STARS ALSO. AND GOD SET THEM IN THE FIRMAMENT OF THE HEAVEN TO GIVE LIGHT UPON THE EARTH, AND TO RULE OVER THE DAY AND OVER THE NIGHT, AND TO DIVIDE THE LIGHT FROM THE DARKNESS: AND GOD SAW THAT IT WAS GOOD. AND EVENING WAS AND MORNING WAS, A FOURTH DAY."

What the inspired penman intended to convey by this announcement appears as well from the language as the structure of the narrative. With respect to the language, all philologists agree that it does not mean that the Sun, Moon, and Stars were, for the first time, called into existence at this period of the Creation. It may, and, as we

shall presently find, does announce, that at this time, the heavenly host, hitherto screened from the earth by the clouds above the firmament, became, by the ordinance and appointment of the Creator, the *visible* rulers and exponents of the times and seasons—"to divide the day from the night, and to be for signs, and for seasons, and for days and years."[8] And that this is necessarily the meaning, is manifest from the structure of the narrative. For if, when Moses announced that in the beginning the Heavens were made, he included the heavenly host as part of that creation, it would be a gross inconsistency, and we might say a contradiction of himself, to state afterwards that they were created on the fourth day. And even if the creation of the heavens could be construed as not including that of the Sun, Moon, and Stars, still it would be highly improbable that any but an inspired writer would have penned a statement, by which the Israelites were called on to believe that light was created before that the Sun, from which it manifestly emanated, was in existence. It is plain, therefore, that the Israelites could not have

[8] Dr. Buckland, in reference to this passage, observes, "What is herein stated of the celestial luminaries seems to be spoken solely with reference to our planet, and more especially to the human race, then about to be placed upon it. We are not told that the substance of the Sun and Moon were first called into existence upon the fourth day: the text may equally imply that those bodies were then prepared, and appointed to certain offices of high importance to mankind; 'to give light upon the earth, and to rule over the day, and over the night,' 'to be for signs and for seasons, and for days, and for years.' The fact of their creation had been stated before in the first verse."—*Bridgewater Treatise*, vol. i. p. 27.

understood the creation of the fourth day as a creation of the heavenly bodies mentioned in it; and it follows, as a necessary consequence, that the language of Moses was not intended to convey any such idea to their minds.

It has always appeared to us, that the order in which the Mosaic narrative has recorded the first dawn of light on the globe, and the first appearance of the heavenly bodies in the firmament, carries with it the strongest internal evidence of its inspiration and truth. For what uninspired writer would have ventured to inform his readers that light was created on the first day of the Creation, but that the heavenly orb, from which it manifestly proceeded, had no place in the creation until a subsequent period. No person, except one who was writing under the dictation of the Spirit of God, would have ventured to postpone the introduction of the heavenly bodies, the obvious sources of light, to the appearance of light itself. But how is this evidence of inspiration strengthened, when we find the unerring records of Nature testifying that light had dawned upon the earth ages before the luminaries of the heavens could have reached any organ of vision that existed on it—that the facts hidden from Moses in the bowels of the earth have been exhumed in these latter days, to bear witness to the truth of what he had written thousands of years ago; and which has been believed by millions of the human race, notwithstanding its

apparent improbability and inconsistency? Truly might the Patriarch of old be said to have prophesied of this, when he exclaimed, "As for the Earth, out of it cometh bread; and under it is turned up as it were fire."

But what is this evidence? Reverting to the Mosaic Record, how speaks it? Darkness was on the face of the deep, clouds and vapours rested on the abyss of waters, until they were at length penetrated by the rays of light; though the Sun, the source of that light, was still invisible from the surface of the globe. The light of that era must have resembled that of a sunless, foggy day. Day and night succeeded each other, but the Sun was never seen to rise or set in the heavens. Next, we are told that the firmament or atmosphere was interposed, and the clouds arose and were spread above, still screening the surface of the waters and the dry land, when it appeared, from the direct rays of the Sun, Moon, and Stars. This dense canopy of clouds, "like a dark ceiling stood," throughout the second, third, and fourth days, or eras of the Creation; and during all that time, none of the then created animals had ever basked in the heat, or gazed on the orb of the Sun—

> "For yet the Sun
> Was not; she in a cloudy tabernacle
> Sojourned the while."

All continued in this state until the work of the fourth day was completed, when the canopy of clouds was dissolved, and the earth and all the

mundane creation beheld, for the first time, the hidden source of the light and warmth which had been so long the chief, but unseen, element of their physical enjoyment and well being.

In the mean time, on the third day of the Creation, terrestrial vegetation had been commanded to spring up and deck with foliage the new-born earth, which had just emerged from the wide expanse of waters. Now, if the Mosaic narrative be true, the plants and herbage which had thus arisen at the bidding of the Almighty, found themselves in the midst of all that could operate to force and nourish a prolific, and, at the same time, a soft and succulent vegetation. *Shade, heat, and moisture* must have surrounded them on all sides—not fitful and varying, but constant and uninterrupted. Shade, by reason of the waters or clouds above the firmament; and heat and moisture, because evaporation was necessary for the supply and continuance of those clouds. Thus, according to Moses, the Earth must have been in the condition of a *vast, shaded, humid hothouse;* which was eminently qualified, as we have already seen, for the production of a most profuse and rapid growth of soft and succulent plants.

Now, did such a vegetation exist at this period of the world's history? Let Geology answer. Every seam of coal that has been brought to light throughout the earth, attests and proclaims the fact, that a vegetation which has never been paralleled in the most prolific tropical climates

of the world of man, was, at this time, spread over every quarter of the globe in which dry land was to be found. Judging from the extent and thickness of the Coal measures, forest after forest, in countless succession, must have expanded into maturity, and sunk beneath the waters, when the mighty masses of this useful mineral were generated and preserved;—

> "Stage upon stage, high waving o'er the hills;
> Or to the far horizon wide diffused,
> A boundless deep immensity of shade."

From the same source, we learn the nature and texture of the plants of which these mighty forests were composed. It has been ascertained by geologists, as we have before stated,[9] that one half at least of the vegetation of the Carboniferous era was of the Fern or Bracken tribe, and the remainder composed for the most part of Equisetaceæ, Calamites, Lepidodendra, and other cryptogamic and flowerless plants; all of which require, as we have seen, uninterrupted *shade, heat, and moisture*, for their production and growth in any abundance. They are all of them of a soft and pulpy nature; and that they were peculiarly so at this primeval period is manifest from the fact that their huge trunks, some of them several feet in diameter, were compressed and flattened by their own weight, wherever they happened to fall in a horizontal or inclining position. This appears from the impres-

[9] *Ante*, p. 74.

sions preserved in the Coal, which invariably present level or flat, instead of cylindrical surfaces; which latter must have been their conformation, if the wood had been of a hard texture.

Nothing can be more certain than the fact that the vegetation of the Carboniferous era was profuse in quantity, and of a quality that indicated the prevalence of *continued shade* for its production. It is equally certain, that such a vegetation could not have arisen in any place exposed to the direct rays of the sun; and we may, therefore, conclude that throughout, and until the close of, the Carboniferous epoch, the Sun's rays must have been veiled from the surface of the globe on which this vegetation was flourishing. In the next system, the Permian, the profuse vegetation of the Carboniferous no longer exists, and the fossil remains of the plants indicate a great increase *of a ligneous or woody tissue*, which could only have been produced by the presence of *the unclouded sunbeam.*

How then stands the question between Scripture and Geology on this point? The fourth day is the period of the Creation represented by the formation of the Coal measures, the Carboniferous system of the geologist,—and we are now standing at the close of it, and on the confines of the Permian, which succeeded it. Behind us lie the multitudinous forests and dense thickets of arborescent Ferns, and of that soft and succulent vegetation, which have been converted into the vast Coal fields that are to be found in all latitudes of

the globe; and which could not have been produced, had the Sun been visible from the Earth's surface;—before us lies the comparatively scanty vegetation of the Permian and succeeding formations, which present us with plants of ligneous tissue, that could not have been produced except under the influence of the direct rays of a visible sun. Can anything more be required to establish the fact, that at this point of time in the chronology of the Creation, the Sun, theretofore veiled by clouds from the Earth, shone out, and, with the Moon and Stars, appeared in the firmament of the heaven, thenceforth, to "be for signs and for seasons, and for days and years."

So far, Scripture and Geology concur in their testimony, that up to the commencement of the Permian system, the clouds above the firmament shut out the Sun from the Earth's surface. And here we may observe, that the phenomena of *central heat* confirm the same truth; for the tepid waters on the Globe's surface, at this early period of its existence, must have sent up a constant stream or volume of vapour, which rested above the atmosphere, and acted as a screen between the Sun and the Earth, until dissolved by the gradual cooling down of the elements. While such heat continued, that of the Sun must have been powerless; and those changes of climate, which are denominated the Seasons, could not then have existed. This gradual cooling of the Earth, and the consequent dissipation of the superincumbent

clouds, was in operation throughout the Carboniferous era; at the end of which the Sun appeared in the heavens, and the alternating seasons commenced their career. This satisfies the terms of the divine decree, "Let them be for *signs and for seasons.*" And, in confirmation of this, it is a remarkable fact, that season rings, the product of the sunbeam on the tree, have never been found in any of the fossil remains of the Carboniferous or the Old Red Sandstone vegetation; but they have been discovered in some of the succeeding systems; and in the Magnesian limestone, one of the members of the Permian system, the heterocercal fishes, clad in that bony armour which was adapted for the tepid ocean of these early ages, disappear, and are succeeded by those horny-scaled tribes which have ever since peopled the cooled waters of the earth.

But there is a remarkable and well-established geological fact, which is even more conclusive as to the change of the climatal condition of the Earth, at this period, from an uniform to a varying temperature, dependent on the Sun, and producing for the first time the phenomena of the seasons. The influence of climate in diversifying the character of the animal and vegetable products of different regions of the earth, is well known. The animals and plants of colder countries are altogether different from those which are found in more genial climes; and identity, or similarity, of species has always been considered to be indicative of identity

or similarity of climate. Now, it is remarkable that the organism of the various systems prior to the Permian, are found to be the same in all the countries in which they have been discovered, whether in the northern or southern hemispheres, in the polar or equatorial regions. The Silurian and Carboniferous fossils of all the districts of Europe in which they occur, not only correspond with each other, but with the fossils of the same systems in India, America, and Africa, though the mineralogical character of the deposits in which they have been buried are, in many instances, very dissimilar. From this identity of the plants and animals in these early epochs, we may safely infer that uniformity of climate prevailed throughout the globe down to the days of the Permian. On the other hand, the fossil remains of the plants and animals of the systems that succeeded the Permian, are found to differ materially from each other in the different countries in which they are discovered. Those of the Lias, the Oolite, and the Chalk, are very dissimilar in form and appearance when found in widely separated localities; and the organisms of the Tertiaries in distant countries differ as much from each other as the animals and plants of the same countries in our own era. The Megatherium and Mastodon were confined chiefly to America, while the Mammoth was a native of Europe; and the Mammals of India are different from both. From these facts, it may be inferred that, subsequent to the Permian age, uniformity of climate,

which was the result of central heat, diffusing an equable hothouse temperature throughout the globe, ceased to prevail; and that diversity of climate, of which the Sun is the principal cause, commenced, and has ever since pervaded the Earth. Consequently, the Sun became, at this era, not only the visible sign for the distinguishing of days and years; but also the efficient cause of the Seasons. It was ordained, as described by Moses, "for signs and *for seasons*, and for days and years;" and has ever since endured as a faithful witness in the heavens.

Besides the foregoing reasons, *the zoology* of the Carboniferous, compared with that of the Permian system, as brought to light by the geologist, furnishes us with further, and not less satisfactory, evidence, that the close of the former, and dawn of the latter, was the time of the first appearance of the celestial bodies to the Earth's surface. There can be little doubt but that Carbon must have impregnated the atmosphere, in these primeval ages, to an extent that must have been inimical to air-breathing animal life. Limestone is composed, one half of lime and the other half of Carbonic acid gas, which must have been originally mixed with the atmosphere: and when we look at the vast masses of the limestone rock which now exist on the globe, and the greater proportion of which have been formed during and since the Carboniferous era, it is manifest that the enormous quantities of that gas, now represented by those rocks, must

have been floating in the air during the growth of the Coal vegetation, and aiding in its production. Now, if throughout that period, the direct rays of the sun were excluded from the surface of the earth, the effect would have been, as we have before stated, that the decomposition of the Carbonic acid gas would have been suspended, and the Oxygen, so necessary to physical life, would not have been exhaled; and without it, the air being impregnated with more of the Carbon than was consistent with the respiration of air-breathing animals, that class of creatures could not have existed; and geology furnishes us with the fact, that with the exception of a few Batrachians, and some insects of humble rank, no terrestrial animal had made its appearance on the earth previous to the Permian and succeeding systems. The Batrachian race are semi-icthyic, and form a connecting link between the Fish and the Saurian or true Reptile; and as creatures of that description have been frequently found, in our own days, imbedded alive in rocks and clays, to all appearance completely excluded from the air, their existence must be very independent of the state of the atmosphere. The appearance, therefore, of such a race of creatures without any other terrestrial associates but Scorpions, Cockroaches, Beetles, and creatures of that description, tends to confirm the fact of the air being still unfit for animal respiration. Such a state of the atmosphere could only be remedied by the increase of the luminous principle, by means of

which the decomposition of the Carbonic acid gas would be accelerated, and the Oxygen dismissed for the nourishment of animal life. The appearance, therefore, of air-breathing animals in the system which immediately succeeds the great vegetable era, with its scanty terrestrial zoology, will be evidence that the shade must have been removed by the dispersion of the superincumbent clouds; for if the existence and nature of the vast vegetation of the Carboniferous period can only be accounted for by the continued absence of the direct rays of the Sun, by reason of which the atmosphere was charged with gases prejudicial to air-breathing animal life, the subsequent appearance of that class of creatures will prove that the clouds must in some way have been dispersed, and the atmosphere purified by the direct influence of the sunbeams.

Thus, all the phenomena of the vegetable and animal existences, not only of this, but of the preceding and subsequent eras, which have been brought to light by the industry and research of the geologist, combine to confirm and establish the Scripture Record, that after the submarine and vegetable creations of the Silurian, Devonian, and Carboniferous eras, the Sun, with its attendant host of Moon and Stars, till then veiled by clouds, sent forth, for the first time, its direct rays to the earth, to prepare the way for the higher class of terrestrial animals, by extracting the gases prejudicial to their life from the atmosphere, and diffusing those which sustain and invigorate. From

henceforth, our earth presents a changed aspect. No longer covered in every part with tangled masses of vegetable matter, and a foliage of pale and sickly hue, it is now to become the abode of terrestrial animals of various forms and habits, and its diminished vegetation is, for the first time, to assume that garb of green which accompanied the sunbeam,[1] and has ever since been the distinguishing hue of the plants and herbage of the earth in all their varieties.

THE FIFTH DAY.

"AND GOD SAID, LET THE WATERS BRING FORTH ABUNDANTLY THE MOVING (CREEPING) CREATURE THAT HATH LIFE, AND FOWL THAT MAY FLY ABOVE THE EARTH IN THE OPEN FIRMAMENT OF HEAVEN. AND GOD CREATED GREAT WHALES, AND EVERY LIVING CREATURE THAT MOVETH, WHICH THE WATERS BROUGHT FORTH ABUNDANTLY, AFTER THEIR KIND, AND EVERY WINGED FOWL AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD. . . . AND EVENING WAS AND MORNING WAS, A FIFTH DAY."

The foregoing translation of this passage does not present to us the exact meaning of the original text; and the inaccuracy has had the effect of misleading the student of Scripture, with respect to the class of animals which were introduced on the stage of existence at this era of the Creation. The work of the fifth day, as thus described in our version of the Bible, is generally supposed to have included the creation of the exclusively submarine animals, besides that of the amphibious marine and

[1] *Ante*, p. 181.

terrestrial Reptiles. But if our construction and explanation of the Mosaic narrative hitherto has been correct, the creation of the exclusively submarine animals, such as the Zoophytes, Mollusks, Crustaceans, and Fishes of the Silurian and Devonian strata, was commenced on the first, and completed on the third day. Consequently, the introduction of that class of creatures into the work of the fifth day, would be inconsistent and contradictory. But that no such consequence is to be apprehended, will appear at once from the following translation of the passage, which every Hebrew scholar will recognise to be critically correct.

"AND GOD SAID, LET THE WATERS SWARM FORTH (BRING FORTH ABUNDANTLY) *the reptile that hath the breath of life;* AND LET FOWL FLY OVER THE EARTH UPON THE FACE OF THE FIRMAMENT OF HEAVEN. THEN GOD CREATED *great sea monsters,* AND EVERY SOUL OF THE *creature that creepeth, which the waters swarmed out, after their kind,* AND *all flying of wing,* AFTER ITS KIND: AND GOD SAW THAT IT WAS GOOD."[2]

[2] The word (שֶׁרֶץ) which occurs in the 20th verse is translated in our version "the moving creature;" but according to Gesenius, it signifies "*a reptile.*" The word occurs in sixteen places in the Pentateuch, and in all of them, with the exception of Leviticus xi. 10, 11 (*vid.* Heb. orig.), it has been rendered in our version "creeping thing." In Lev. xi. 10, 11, it plainly designates an aquatic animal, different from a fish, having fins and scales. According to the same authority, the word (יִמְשָׁה) which in the 21st verse is translated "the creature *that moveth,*" ought to be rendered "*the creature that creepeth.*" The same verb occurs in fourteen other passages of the Pentateuch; and in all of them it is translated so as to indicate a creeping motion. The expression in the 20th verse (נֶפֶשׁ חַיָּה) translated "creature that hath life," ought to be rendered "*the breath of life.*" The word נֶפֶשׁ, according to Gesenius, signifies *breath,* being derived from the word "נָפַשׁ, to breathe strongly, to pant."

Thus, the creation of this era emanated from the waters in great abundance; and that creation consisted of three classes of air-breathing animals, viz.—first, the great Sea Monsters; second, the Creeping things which the waters swarmed forth—though of aquatic habits, these were furnished with organs wherewith to creep or crawl upon the land; and third, the Winged creatures that soared above the earth.

Such are the recorded productions of the fifth day of the Creation. Let us now search the Book of Nature, and we shall there find that the race of animals which make their appearance, for the first time, in the Permian and Oolite systems, correspond exactly with those described by Moses. At these systems we have now arrived. The long ages, during which dark masses of unbroken clouds overspread the deep forests and dense foliage of the Carboniferous era, have passed away, and the gladdening sunbeams have, for the first time, saluted the earth from the blue canopy of the open heavens: while the gigantic vegetation has sunk down into its recesses, to be disinterred only when the necessities of the still far distant race of intelligent beings, in the progress of civilisation, shall require to use the hidden blessing laid up for them by a beneficent Providence, ages upon ages before their existence as part of the Creation. The first animal occupants of the dry land were obviously of the Reptile race. This is a fact established *beyond* dispute, and admitted by all geologists.

The traces of a few Batrachians are found in the Carboniferous system; but creatures of that class are only semi-reptiles, entering into life in the form of fishes. The true reptiles are of the Saurian or Lizard tribe, whose earliest organic remains are found in the Magnesian limestone, a member of the Permian system. But ascending a little higher, to the next series of strata, to the Oolite, we find, that, as described by Moses, they swarmed forth in such astonishing abundance, that the era, represented by the deposition of this formation, has been termed by geologists "the Age of Reptiles." It is here, therefore, that we are to search for the confirmation of the Mosaic record, that they were *vast and abundant*—and what do we find?

Our first witnesses of the truth of what has been written, are the huge *Elaniosauria* — the Icthyosauri and Plesiosauri, with other marine Reptiles of the same class, which have been already described,[3] and whose forms were peculiarly adapted for an aquatic life; though, from their organic remains, it is obvious that they were air-breathing oviparous Reptiles. These all appear in vast abundance, for the first time, in the Permian and Oolite systems; and in them we have no difficulty in recognising the Mosaic הַתַּנִּינִם, or, "*great sea monsters.*"

Our next witnesses are the *Dinosauria*, or gigantic terrestrial Saurians, of which we have already portrayed the Megalosaurus and Iguanodon as specimens of the class.[4]. Their organic remains are

[3] *Ante, pp. 88, 89.* [4] Ante, p. 90.

found, for the first time, in the same systems; and they are "*the creeping things which the waters swarmed out*," as described in the Scripture record.

Lastly—in these systems also, we behold, for the first time, the fossil remains of the various species of *Pterosauria*, or Pterodactyles,[5] those strange lizard forms, which were provided with wings wherewith "*to fly over the earth, upon the face of the firmament of heaven.*" And in the New Red Sandstone, one of the Permian strata, we also find the first traces of the feathered tribes (some of them, like their Saurian contemporaries, of extraordinary stature), in the foot-prints impressed on the soft mud and sand on which they stalked; and which, converted into stone, have been preserved through long ages, as further witnesses of the truth of the Mosaic statement, that at this period God created "*the flying of wing* after its kind." What can be more interesting than evidence of this nature! Sand, the sport of every breeze and wave that sweeps over it, has ever been considered the type of all that is fleeting and unstable. An impression on the sand has been commonly used as a figure of speech, to indicate the most evanescent of earthly things—a building on the sand, the most feeble and unsteady; and yet, in the footprints of an animal impressed on the sea-shore ages upon ages before the dawn of the human era, we are permitted, by the goodness of the Almighty, to read an imperishable testimony to the truth and inspiration of his revealed word to man.

[5] *Ante*, p. 91.

All these Saurian Reptiles—Elaniosauria, Dinosauria, and Pterosauria or Pterodactyles—resemble the race of birds, which were introduced in association with them into the Creation, in one particular, viz. that they were all of them *oviparous*, generating their species through the medium of eggs. This is the type, or distinguishing characteristic, of the whole class of the air-breathing creatures which now became the first, and continued for long ages to be the sole, occupants of the dry land. This period of the world's history might therefore, with propriety, be termed the oviparous, or egg-bearing animal era. What more can be required to vindicate and establish the truth and accuracy of the written Record? Three classes of animals, *air-breathing*, but proceeding from the waters, and therefore more or less aquatic in their origin and habits, are described by Moses as the creation of this era—*great sea monsters—creeping animals from the waters—and winged creatures:* and the Record of the rocks exposes to our view the first of these, in the organic remains of the huge Elaniosauria—the second, in those of the still more gigantic Dinosauria—and the third, in the fossilized Pterodactyles, and the footprints of the Birds in the New Red Sandstone formation. All is consistency, for all is truth.

It is worthy of observation, that none of the wondrous scenes of the primeval world have more particularly attracted the notice of geologists, than that which the earth presented during the days of

the deposition of the Lias and Oolite. The extraordinary abundance and vast dimensions of the Reptile population of that era have been the favourite themes of wonder and speculation to all geologists; and it is no less remarkable, that the only portion of the Creation as recorded by Moses, in which he gives any information respecting the size or extent of the created animals, is that of the fifth day; where he states, that the creeping things were brought forth "ABUNDANTLY," and that there were "GREAT sea monsters." If the scenery of the Lias and Oolite had been exhibited to his sight (as we say it was), all geologists must agree that he would have beheld the Earth, Sea, and Air swarming with multitudes of gigantic Saurian Lizards, which could not have failed to strike him with an astonishment, that would, in all probability, have found utterance in the peculiar language of that part of his narrative. *The number and size* of the Reptile race are the features of the era of the Lias and Oolite, on which the Geologist dwells —"*Abundant*" and "*Great*" are the epithets applied by Moses to the creeping things of the fifth day or era of the Creation. Is not this some confirmation of the identity of the two scenes— some evidence, that Moses has described what the geologist has brought to light of this remarkable epoch, "the Age of Reptiles?"

The forms of these strange first-born of terrestrial creatures, reconstructed and restored by the research and skill of the comparative anatomist,

may be seen in the grounds of the Crystal Palace at Sydenham, where the student of Scripture may realize to himself the varied shapes and vast dimensions of these Monarchs of the Earth, Sea, and Air, in the days of their abundance; when human reason and responsibility were unknown within the precincts of our globe, and no creature of an organization higher than their own was in existence, to dispute their supremacy. Let him compare these stupendous beings with the Scriptural description of those created on the fifth day, and he cannot fail to recognise, in their strange and varied forms, the great sea monsters, the creeping things which the waters brought forth, and the flying of wing, of which Moses spake in the first chapter of Genesis.

This era of the fifth day extended from the commencement of the Permian to the close of the Oolite, or beginning of the Chalk formation, in which we find the first specimen of terrestrial Mammalia, in the form of the Marsupial, which is a connecting link between the Reptile and the Mammal. It was indeed a remarkable era; and not the less so because of the, comparatively speaking, early disappearance of these huge tyrants of the then Creation in the Cretaceous system; and they are now represented by the scanty family of the Crocodiles, Iguanas, and Lizards of our own era—degenerate descendants of such ancient, numerous, and gigantic ancestors.

THE SIXTH DAY.

"AND GOD SAID, LET THE EARTH BRING FORTH THE LIVING CREATURE AFTER HIS KIND, CATTLE, AND CREEPING THING, AND BEAST OF THE EARTH AFTER HIS KIND: AND IT WAS SO. AND GOD MADE THE BEAST OF THE EARTH AFTER HIS KIND, AND CATTLE AFTER THEIR KIND, AND EVERY THING THAT CREEPETH UPON THE EARTH AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD."

The creatures here enumerated as the creation of the sixth day, are the Beasts of the forest, the Cattle of the hills, and the Creeping things of *the earth*—all of the Mammal race, and distinguished from the previous oviparous members of the Creation by the peculiarity of procreating their species by uterine gestation. The simple record of Moses is, that the quadruped Mammalia came into existence after the epoch of the oviparous Reptiles; and nothing can be more conclusive than the testimony of Geology, that such were the facts as they actually occurred in the progress of Creation. Whether we assume that the creation of the Mammalia commenced with the appearance of the half-reptile Marsupial at the close of the Oolite, or whether we assume that it commenced with the Pachydermata of the Eocene, the era of the Mammal succeeded that of the oviparous Saurian Reptile races: and the Scripture narrative is truth.

For a long series of ages, represented by the formation of the Tertiary deposits, the quadruped Mammal reigned supreme in the Creation, until

another creature of the same class of physical organization, but immeasurably superior, and distinguished by reason and responsibility,—qualities till then unknown in created beings on our planet, —came into existence. This event is announced in the Mosaic narrative as part of the Creator's work on the sixth day.

"AND GOD SAID, LET US MAKE MAN IN OUR IMAGE, AFTER OUR LIKENESS; AND LET THEM HAVE DOMINION OVER THE FISH OF THE SEA, AND OVER THE FOWL OF THE AIR, AND OVER THE CATTLE, AND OVER ALL THE EARTH, AND OVER EVERY CREEPING THING THAT CREEPETH UPON THE EARTH. SO GOD CREATED MAN IN HIS OWN IMAGE, IN THE IMAGE OF GOD CREATED HE HIM; MALE AND FEMALE CREATED HE THEM. AND GOD BLESSED THEM, AND GOD SAID UNTO THEM, BE FRUITFUL, AND MULTIPLY, AND REPLENISH THE EARTH, AND SUBDUE IT: AND HAVE DOMINION OVER THE FISH OF THE SEA, AND OVER THE FOWL OF THE AIR, AND OVER EVERY LIVING THING THAT MOVETH UPON THE EARTH."

In this record of Man's creation there are two cardinal facts stated, which are capable of receiving confirmation from the contents of the Book of Nature. First, that the human race was the last created of the animal kingdom; and second, that the whole human family descended from a single pair of ancestors.

As to the first of these propositions, we have already seen, that there is no truth, in the wide field of nature, which rests on a more sure and satisfactory foundation, than that Man was the last item in the progressive scale of created beings. In this the Geologist and the Religionist concur. Whether we consider his moral and intellectual status, or his physical structure and organization,

he manifestly and distinctly stands on the highest of the ascending steps of that creation, which commenced with the humble Zoophyte, and has advanced upwards through the expanding, but perfectly distinct, organizations of the Mollusk, Crustacean, Reptile, and quadruped Mammal; and it is obvious that, in the divine plan, thus manifested and exemplified, Man's proper station ought to be exactly where Scripture and Geological facts have placed him. Not a particle or trace of the human form,—not a record or vestige of any work of art, is to be found in the stratified deposits, in which are embedded the organic remains of all the previous races of animals: and therefore, all these orders of animated nature were in existence ages before the breath of life was breathed into his earth-formed frame, and lordship over the existing creation was conferred upon him. Had any creature in the likeness of Adam trod the earth during the deposition of the stratified deposits, his form and works must have been traced in as legible characters on the framework of our globe, as the forms of those plants and animals which have been exhumed in such abundance by the practical Geologist.

Thus, we are furnished with evidence which, though negative, is most conclusive, that the several families of the Creation, comprised in the Mosaic and Geological catalogues, were in existence before the formation of one of the human species. This crowning event was the last and

greatest of all. Scripture chronology fixes the date of it to have been about six thousand years anterior to the present time; and there is nothing in the aspect of nature in general, or of Man in particular, to lead us to think that this date is not substantially correct. History and tradition, ancient monuments and records, tell us of a time when whole continents were unpeopled, or nearly so; and of a progress of population, arts, sciences, and civilisation over most parts of the globe, which is in perfect harmony and consistency with the Scripture account of the origin and descent of the human race from a single pair of ancestors. Capacity of progress is the distinguishing characteristic of Man; and, had his species been in existence even at so comparatively recent a period as the Pleiocene, the last of the stratified deposits, every corner of the globe must have been crowded with evidences of his physical and mental powers, myriads of years before the Mosaic date of his existence. All the luxuries and ornaments of civilised life,—the arts and sciences, which are the natural offspring of the human mind when brought into contact with the physical world, must have attained their perfection ages ago, and left imperishable records of states of society, equal or superior to those of the most civilised nations of the world of the present day. This is the argument conveyed by the well-known lines of Lucretius,

> "Si nulla fuit genitalis origo
> Terrarum et cœli, semperque æterna fuit,
> Cur, supra bellum Thebanum et funera Trojæ
> Non alias alii quoque res cecinere poetæ."

This evidence, though not demonstrative in its nature, like the facts of Geology, is nevertheless most satisfactory and convincing, when adduced in confirmation of what is stated in Revelation, and consistent with the stony legends, that the human race came into existence within the last six thousand years.

Second: all mankind have sprung from a single pair of ancestors. This community of origin necessarily involves the question of the unity of the human species, a subject on which there has been a considerable diversity of opinion, and much discussion among naturalists. That there are varieties of the race, as they at present exist on the earth, is obvious. The inhabitants of some countries differ from those of others, not only in language, demeanour, and in habits, but in shape and colour; and have, in consequence, been divided by some Ethnologists into five, and by others into seven races; but it is admitted, that there are some members of the human family which cannot be included in either of these classifications. These diversities have been supposed by some to be characteristic of distinctness of species; but the best informed of those philosophers who have studied the subject, concur in the opinion that they are only varieties of a single species, and that between the groups thus formed, no true typical distinction can be recognised. They are only varieties, and not species, which would imply separate primary ancestors. The colour of the skin, and the form *of the skull* and pelvis, are the principal features

of diversity; and these, according to Blumenbach, Prichard, Humboldt, and others who rank high in this department of physical knowledge, are such as may be referred to, and satisfactorily accounted for, by external circumstances, such as climate, soil, food, mode of life, artificial treatment, continued through long periods of time, and other causes which may yet be discovered.

The character and structure of languages, also, and the identity of the inward and mental nature that is to be recognised in all the races of mankind, entitle us, according to Dr. Prichard, "to draw confidently the conclusion that all human races are of one species and one family."

Thus, the Archaic record of the origin of Man, the final and completing work of the Creation, is fully confirmed by the information and instruction contributed by history, tradition, experience, and science to the stock of human knowledge. Geology informs us, in confirmation of the written Word, that there was a time, and that too of comparatively recent date, at which none of Adam's race were to be found within the precincts of our planet, while all the other races of animals were its inhabitants. And physiology, history, and experience teach us also, in confirmation of Scripture, that all the different races of the human family, now spread over the face of the Globe, have descended from a single pair of ancestors.

But Man was to "have dominion over the fish of the sea, and over the fowl of the air, and over

every living thing that moveth upon the earth." All these classes of the animal kingdom, with the herbs and trees of the vegetable creation for his use and sustenance, surrounded him on his entry into existence. Zoophytes, Mollusks, Crustaceans, and Fishes tenanted the waters. But the Zoophyte, Mollusk, Crustacean, and Fish of the Silurian and Devonian eras, are not identical with those of the human era. None of the more ancient species are now in existence. The various changes which the earth and the waters have undergone, have operated through the long intervening succession of ages, in so altering and modifying their natures and habits, that none of the original species are now to be found. Varieties of temperature and atmosphere, soil and climate, means of subsistence, and other surrounding circumstances, which the slow progress of long ages brought in its train, must, within certain limits, have caused important corresponding changes in the animals and plants exposed to their influence—such animals and plants having a natural tendency, as experience testifies, to adapt themselves to their varying positions and circumstances. For instance, the first Mollusks which Geology presents to us, were clad in horny shells, by reason of their lot having been cast in the muddy oceans of the Lower Silurian system, which were devoid of lime for the secretions of calcareous shells. When lime became more abundant, this same class of animals formed for themselves shells of that substance, which

transferred them to a different position in their order. Again, the high temperature of the primeval waters must have had a considerable influence on their inhabitants. The species of the first fishes, the Placoids and Ganoids of the Devonian and Carboniferous eras, were, as we have seen, clad in osseous coats of mail, calculated, as it has been suggested, for creatures destined to live in tepid waters; and when, in process of time, the temperature had cooled down, this bony armour and its invariable accompaniment, the heterocercal tail, faded away, and are succeeded by the horny scales and homocercal tail of the Cycloid and Ctenoid families, which, though in altered forms, exist to the present day. The same may be said of the Reptile and Mammal races, many of which have died out, and others have become altered by similar adaptations to surrounding circumstances. The mighty Saurians of the Lias and Oolite have disappeared; and the gigantic Mammals of the Tertiary era have dwindled down to the, comparatively speaking, pigmy quadrupeds of our own times.

But still, all these variations take place within certain limits; for no change of circumstances could operate to convert an animal of one class into one of another; for instance, an herbivorous into a carnivorous creature, much less a Mollusk into a Fish, a Fish into a Reptile, a Reptile into a Bird, or a Bird into a Mammal. They were all formed by the Almighty on peculiar and defined

models, "*each after its kind;*" and have been preserved separate and distinct under all the varying circumstances of the external world. But though the Zoophyte, Mollusk, and Crustacean of the human era are different in form and habits from those of the Silurian, they are, nevertheless, their lineal descendants in the sense of parent and offspring. In like manner, the Reptiles, Birds, and Mammals, which are the associates of Man, have all descended from the first created of their kind, as our contemporary fellow-men are all of them descendants of their common progenitor, Adam. Thus, created beings, in proportion as they are low in organisation, are high as regards the antiquity of their races; and in comparison with all the other orders of the animal kingdom, Man is but a *parvenu*, a creature of yesterday. Each of the leading associate classes of the creation were in succession the Monarchs of the world, before that the first of his race had appeared upon the earth.

This is the true relationship and connexion which exists between the former and present races of the animal and vegetable creation, and is consistent alike with Geology and Scripture. Very different is the development or transmutation theory, which was first propounded by Lamarck and De Maillet, French zoologists, and which has been lately revived by the author of "The Vestiges of the Natural History of Creation." Their theory is, that organic life commenced in

the lowest and most simple forms, and being endued with an inherent property of progressive improvement, it has advanced, by the operation of pre-ordained natural laws, from the inferior to the superior orders of beings, without any interference on the part of the Deity, or any exercise of his immediately superintending power in the mundane economy. According to those philosophers, this law is not only the tendency, which we observe in the various species of the animal and vegetable creation, to adapt themselves to surrounding circumstances at successive periods of time, but a tendency to provide themselves with organs to supply certain wants and desires imprinted in their natures; so that "organisation is the result of function, and not function of organisation." And under the influence of this so-called law, and independent of all creative interference, the Zoophyte has expanded into the Crustacean, the Crustacean into the Fish, the Fish into the Reptile, the Reptile into the Bird, the Bird into the Mammal, and the Mammal into Man. In like manner, the noblest tree of the human era has, it is said, derived its origin from the lowliest Fucoids and Algæ of the primeval waters.

Thus, according to these theorists, the lineage of Man is naturally and progressively derived, without the interposition of God, from the humblest forms of animal life. The Zoophyte was one of his remotest ancestors; and the Mollusk, Crustacean, Fish, Reptile, Bird, and Mammal

figure as blood-relations in his pedigree; while the Frog and the Monkey are stated to have been his more immediate progenitors.[6] Ludicrous and absurd as this may appear, it is no misrepresentation of the development system. Nor is the case mended, when we enter into the particulars of these strange transmutations, and read the grave suggestions of some of these theorists, that the Fish, by an attempt, or conatus, as it is termed, to invade the land, became, in some unaccountable manner, furnished with legs, feet, and other appendages of a terrestrial animal; and by a conatus to fly, found himself, by some equally surprising freak of his nature, covered with feathers. These are the suggestions of Lamarck and De Maillet. It must, however, be admitted that the more recent expounders and patrons of this theory do not follow out their speculations to the same extent, by entering into the minutiæ of the mode of transmutation

[6] In tracing the pedigree of Man, the development philosophers seem to consider that the Frog has better pretensions than the Monkey to be installed as the direct ancestor of the human species, on the ground that it is the only animal besides Man that is furnished *with a calf to its leg.* The proposition is thus stated by the author of "The Vestiges." "It may here be observed, that of all the Reptilian orders, the Batrachian is that which has best pretensions to a place in the origin of the Primates. 'It is singular,' says Dr. Roget, 'that the Frog, though so low in the scale of vertebrated animals, should bear a striking resemblance to the human conformation in its organs of progressive motion.' It is the only animal besides Man with a calf to its leg. '1t evidently is making,' says Dr. Roget, 'an approximation to the higher orders of Mammalia.' "—*The Vestiges of the Natural History of Creation*, p. 196, 6th ed.

from one species to another; but, without committing themselves to details, they do insist that the various races of animals and plants have resulted from transmutations, under the influence of prearranged laws of nature, without any exercise of creative power, or any special interposition of the Deity.

The question is between an original adjustment by the Almighty and the continual interposition of the Almighty—between those who deny, and those who maintain, a special guiding and directing Providence in the operations and course of the physical world. The processes of nature are uniform and regular, and *uniformity and regularity* are the attributes of a wise, good, and merciful God, and, as such, ought to attest his presence. But because they do exist in all the operations of the physical world, and because there are no symptoms of inconsistency or caprice in its government, these philosophers of the development school deny his presence altogether, and assimilate the course of Nature to the movements of a well-adjusted machine, which progresses with independent action. Cold and insensate philosophy this, which, rejecting revelation, affects that it is more easy to conceive an universe, such as ours, in operation like lifeless machinery, than to comprehend it as being under the guidance and direction of an omniscient and omnipresent Creator; and commits unreasonably to Nature's laws that which belongs to Nature's God alone.

> "The Lord of all, Himself through all diffused,
> Sustains, and is the life of all that lives.
> Nature is but the name for an effect,
> Whose cause is God."

Materialism was the avowed creed of those with whom these doctrines originated; and their rejection of an intelligent First Cause was, it must be conceded, more consistent with such principles, than the avowal by their more recent supporters of their belief in a supreme Author of the universe; for, while the latter admit that there must have been a Creator, they cautiously abstain from any definition of what it is that He has created, and confess that philosophy cannot determine the beginning of physical causes, or define the created entities from which all others have been developed. Lamarck speaks of something which he styles "*monads*," as being the only things to which Nature gives birth directly. Oken observes, that "no organism has been created of larger size than the *infusorial point*, which is microscopic: all larger forms are developed, not created"—and no other author seems to have suggested anything more definite on the subject. But whether these alleged rudiments of organised forms are styled "monads," or "infusorial points," their existence and origin are admittedly mere conjecture, and, as such, amount to confessions of an ignorance of matters beyond the province of reason, which could only be removed by a revelation from the Most High, to lead us into the knowledge of that

relationship which exists between the Creator and the created.

Nevertheless, the development philosophers of the present day do concede that an universe without a divine author is inconceivable: and we may add, that if the existence of a mundane system necessarily involves that of a Creator, its continuance in a state of order as necessarily implies his guiding hand and controlling power. As a metaphysical proposition, the one is as self-evident and convincing to an intelligent mind as the other. To these dreamers the creation of monads or infusorial points, which, by their own inherent powers, produce all the complex organic structures of the animate and inanimate world, presents no difficulty; but statements that the Creator continues to clothe the lilies of the field, and to number the hairs of the head, are treated by them as fictions, or figures of speech—and yet they are simple truths by which the omnipotence, omniscience, and omnipresence of the Almighty are presented and realised to the believer's mind; qualities which can have no existence or meaning, if the principles of the development theorists are true.

Such is the theory of progressive development, which, admitting the existence of God, excludes Him from all immediate superintendence over the affairs of the world which He has created and furnished; and by degrading man to the level of the brutes that perish, deprives his soul of all claim to immortality. But for these consequences, so

strangely welcome to many a human heart living in a state of resistance to God, this fanciful dogma must have been long since discarded by all reasoning minds, as one of those amusing conceits which are frequently the offspring of perverted learning and misapplied research. It receives no countenance from Geology or any other science, and is wholly inconsistent with revelation. Among the vast quantities of the fossil remains of every class of animal, no specimen has been discovered which could be taken to indicate such a transition from one race or order of those creatures to another; and each *after its own kind* is as perfect on its first appearance and, generally speaking, more so, than at any other period. For instance, the first fishes of the Devonian system are more complete and elaborate in their organization and structure than any of their successors; and the changes which have taken place in this, as in every other class of the animal creation, indicate a degradation of race rather than a progression. The Zoophytes, Mollusks, and Crustaceans of the Silurian age, and the Placoid and Ganoid vertebrates of the Devonian, are superior in organization to any that have since occupied the waters of the globe. The first Saurian reptiles of the Lias and Oolite were giants, which have never been paralleled by any of their race in after-ages; and the Mammals of later times are but pigmies, when compared with the colossal Megatheria, Mammoths, and Mastodons of the Tertiaries. There is nothing, therefore, in Geo-

logy, when rightly understood, which supports the theory of development.

Leaning on God's Word, and reading the written and the stony records together, we are preserved from all such whimsical reveries and dangerous speculations. We find in the Book of Nature, as far as we have been able to decipher it, that organic life began with the Zoophyte, and then appeared, at successive periods, in the advancing orders of the invertebrate and vertebrate animal kingdom up to Man; but appealing to the written record, we find, that at the different stages of the creation of such of these orders as are there noticed, the God who had made the heaven and the Earth in the beginning, uttered his fiat for the birth of *each of them after its kind*, and Nature responded —thus interposing, and preserving to each of the respective orders of the animal kingdom, its own distinct and separate origin and lineage. If, therefore, the Mosaic narrative be true, the continued active interposition of the Creator in the production of the several items of the Creation is established, and the theory of development, or transmutation by natural law, is at an end.

How necessary, then, is it for the cause of Revelation that the identity of the two Records should be established—more especially when we find that on their presumed inconsistency, the advocate of the development theory has attempted to get rid of the Scriptural argument against it! The Rev. Baden Powell, a Professor in the University of

Oxford, after observing on what he terms "the irreconcilable contradiction between the whole view opened to us by Geology, and the narrative of the Creation in the Hebrew Scriptures, whether as briefly delivered from Sinai, or as expanded in Genesis," and that "in the minds of *all competently informed persons* at the present day, after a long struggle for existence, the literal belief in the Judaical cosmogony, it may now be said, has died a natural death," proceeds to reason in favour of the development theory as opposed to revelation; and observes, that "those who accept geological truths at all, and admit the *palpable contradiction* to the Old Testament without prejudice to their faith, cannot with *consistency* make it a ground of objection to any hypothesis of the *nature* of the changes indicated, that they are *contrary to Scrip ture. They are no more so than all Geology is.*"[1]

When we find a learned Professor thus upholding a doctrine which excludes the active disposing and guiding presence of the Deity from the world and its inhabitants, by pouring contempt on his written word, it is time for the believer to inquire whether there is truth in his suggestion, that there is an irreconcilable contradiction between Geology and Scripture. Let the foregoing pages decide if the literal belief in the Judaical cosmogony has died a natural death. So far from such being the fact, we assert with confidence, that every class of being which has lived on the Earth, or stirred in the

[1] The Unity of Worlds, pp. 457, 460.

waters of the Globe, since time began, proclaim from their stony sepulchres, in language that no Sceptic can contradict, that the cosmogony of Moses and the cosmogony of Nature are identical; and that the Creator alone could have communicated the Scripture record to his inspired servant. And if inspiration guided the pen of Moses, it is not for man to reject what God has revealed, in order to uphold a theory that is not countenanced by any of the phenomena of nature, and which is contradicted by the written word, that "in Him, and to Him, and through Him are all things."

CHAPTER V.

THE INSPIRATION OF THE MOSAIC RECORD.

"The world's a prophecy of worlds to come."

YOUNG.

WE have now unfolded and compared, step by step, and line by line, our two records of the Creation; and not only have they proved consistent throughout, but they fully confirm, corroborate, and mutually elucidate and explain each other. We have accompanied the Geologist through the creations, and we have dwelt with him among the creatures of the pre-Adamite world. With him, we have been present on our planet when it was a dark and lifeless mass; and with him, we have witnessed the first glimmer of life and light that dawned upon the watery globe. With him, we have explored the shoreless ocean of the Silurian ages, and its population of submarine invertebrates, when the highest specimen of creative power was a lowly Crustacean. With him, we have seen the first speck of land that arose from the world of waters when the Silurian closed, and the Devonian system began; and with him, we have penetrated and surveyed the mighty and many successive forests which clothed the earth, and supplied the

vast coal deposits of the Carboniferous era. With him, we have gazed upon the giant reptiles of the Lias and Oolite, and the colossal birds which have left their footprints in the Permian sandstone—sole tenants of the land for unnumbered ages; and with him, we have seen these monarchs of their time decay, and their kingdom given to another and a higher order of beings, the Mammal races, which succeeded them in the Tertiary period of our planet's history.

Strange scenes were these; and strange it is, that, after the many revolutions and convulsions which, for countless ages, have swept over and through these cemeteries of bygone creations, they should be reproduced by the Geologist for our contemplation and instruction, on whom the ends of the world are come. In each and all of them we have been presented with unerring testimonies of the faithfulness and accuracy of the divine historian's report of the nature and order of the work of the Almighty, in his process of forming and fashioning the Earth and all that therein is; and thus the phenomena of Geology, instead of disproving the Record of Moses, are found to form a series of golden links which connect the God of nature with the God of revelation. A short retrospect will confirm this important fact.

From Scripture we learn, that "in the beginning God created the Heaven and the Earth, and that the Earth was without form and void (invisible and unfurnished), and darkness was upon the face

of the deep." From Geology we know, that there was a period in the ceaseless flow of time, when the Earth, which is now clothed with verdure and throbs with animated nature, was a watery waste, devoid of physical life, and enveloped with muddy vapours which shut out the rays of light from its surface.

From Scripture we learn, that while darkness was yet on the face of the deep, the creative Spirit of God brooded on the waters, and life preceded light. By Geology we are taught, that the Spirit of the Creator terminated the lifeless state of our planet in the next succeeding period of time, by pouring submarine life into the expanse of the primeval ocean; and that the earliest created specimens of physical life, the Zoophytes of the Cambrian, were devoid of organs adapted to the perception of light—thus leading to the conclusion that, in accordance with the Mosaic narrative, light had not dawned upon the globe when life first stirred in the waters that encircled it.

From Scripture we learn, that by the Almighty fiat light was then let in upon the Globe. Geology presents to us the next immediately succeeding class of created beings, the univalve Cephalopods, the Trilobites, and other Crustaceans of the Silurian system, furnished with organs of vision; thereby attesting the advent and presence of the luminous principle.

From Scripture we learn, that on the second day the Atmosphere was formed, and that a

canopy of clouds was suspended above the firmament, veiling the heavenly host of Sun, Moon, and Stars from the face of the Globe; that afterwards, on the third day, dry land and land vegetation appeared; and finally, on the fourth day, the canopy of clouds being dissolved, the heavenly bodies were for the first time disclosed, to be from thenceforth "for signs, and for seasons, and for days, and for years." From Geology we know, that at the close of the Silurian submarine creation, vast mountains were upheaved by volcanic forces from the deep, and land vegetation made its first appearance, attesting the previous existence of an atmosphere; and from the same source, disclosing to us the mineral contents of the great coal measures, we know that the nature, quantity, and quality of the vegetation which then sprang up, were such as demonstrate the growth to have taken place under circumstances indicative of *long continued shade*, which must at last have been dispelled by the dispersion of the superincumbent clouds, and the admission of the direct rays of the Sun to the Earth's surface. Thus, both of our Records concur in testifying that the order of Creation was—a clouded atmosphere, dry land and its vegetation, succeeded by the direct and unimpeded radiance of the Sun, Moon, and Stars.

From Scripture we learn, that the next display of creative power was an abundance of great sea monsters, terrestrial reptiles, and winged

creatures; and Geology exposes to our view, in the next succeeding strata, the organic remains of the then existing tenants of the ocean, the land, and the air; and we behold profuse swarms of the gigantic Saurians which peopled the earth in "the age of Reptiles"—Elaniosauria, tyrants of the deep; Dinosauria, tenants of the land; and Pterodactyles and feathered Birds, the flying of wing through the firmament above the earth.

From Scripture we learn, that the next step was the creation of cattle, and creeping things, and beasts of the Earth (the Mammalia). From Geology we know, that the race of quadruped Mammals did not come into existence until after the age of Reptiles; that the Saurian monsters, with the other oviparous Reptiles and Birds, had been tenants of our globe for ages before we find the traces of a quadruped Mammal.

Lastly, from Scripture we learn, that the closing and completing work of the Creation was Man; and Geology triumphantly confirms the revealed fact, that submarine animals, land vegetation, Reptiles, Birds, and quadruped Mammals, were all of them in existence, successively and collectively, ages before the first of the human race.

Thus the Record of Moses and Nature's Record are found to be consistent in every particular; and, so far from exhibiting contradictions, or even discrepancies, they sound the same note, and harmonise in every line of their wondrous hymn

of glory and praise to the great Creator and Lord of all.

This coincidence between the narrative and the events cannot be deemed to have been casual. The mind of the writer must, therefore, have been supplied with an accurate knowledge of the facts he has chronicled, which could only have been derived from the ordinary sources of human knowledge, or from some supernatural communication. If his information was acquired from a natural source, he must have been not only acquainted with all the phenomena of Geology, but his acquirements in Mineralogy, Zoology, Botany, and Chemistry, must have been extensive and accurate. He must have been familiar with the several successive revolutions through which the mass of our planet has passed, and the phases which her surface has presented since she first appeared in the form of an igneous globe; and must have known that after the igneous age a watery epoch ensued, when she was girded with a shoreless ocean, and her sole inhabitants were tenants of the deep. He must have known that this watery period was succeeded by a great woody or vegetable era, which was followed by the successive ages of vast and abundant reptiles, of mammals, and lastly, of the human race. He must have known that though light had appeared on the first day of the Creation, the visible orbs of the Sun, Moon, and Stars, were veiled, through a vast lapse of time, by clouds until the close of the

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great woody era; and for this, it was necessary that he should have been acquainted with the existence of the coal mines and their vegetable contents, and the nature and effect of the sunbeam on vegetation and the atmosphere. All this knowledge, at the least, must have been present to the mind of the writer of the Mosaic narrative, if he wrote not under the inspiration and direct dictation of the Most High.

Moses was learned in all the wisdom of the Egyptians; but who will venture to suggest that the foregoing items of knowledge were comprehended in the lore of that ancient people, upwards of three thousand years ago? And even if Moses had possessed such knowledge, who will say that, under the guidance of mere human wisdom, he could have traced so concise and condensed an epitome of the progress of the formation of the world and its inhabitants, more especially, when we recollect, that the wisest and best of our modern philosophers, furnished with all the knowledge which science and research have been accumulating for centuries, have not, to the present hour, recognised the Mosaic narrative to be, what it is, a synopsis of the vast events which they and their predecessors, without any reference to Scripture, have been learning and arranging from the stony leaves of Nature's book?

Here is evidence of divine inspiration, more satisfactory and conclusive in its nature than even that which is to be derived from fulfilled prophecy.

The buried palaces of Nineveh, the lone wilderness of Idumea, the barren wastes of Palestine, and the scattered race of Abraham, dwelling amid the nations of the world, and yet alone, separate and distinct from all, are fulfilled prophecies, and testify of the inspiration of the holy men of old, who described these scenes as they now are, long before the descent from their proud prosperities had commenced. But nature's treasury supplies other witnesses, which attest, with more conviction to the human mind, the divine origin of God's word. The lifeless Azoic rocks tell us, that there was a time when "the earth was without form and void." The Silurian testifies that then the creative Spirit of God moved in the waters, and light dawned; the Devonian, that after another lapse of time, land and land vegetation arose from the deep; the Carboniferous, that the Sun appeared not to an earthly eye until its close; the Permian, Lias, and Oolite, that the Saurian great sea and land reptiles, and the flying of wing were then ushered into being; and the Cretaceous and Tertiaries, that beasts and cattle succeeded, and peopled the earth for ages before that Man, the last of all God's creatures, stepped forth, in his Maker's image, on the earth prepared for his habitation. This cloud of witnesses of the truth of the Scripture record was unknown to Moses, who penned it. To himself, the generations of men which preceded, and those which succeeded him for three thousand years, these leaves of Nature's book were *sealed and silent;* and yet, from these alone, it not

directly revealed by God, could the knowledge of the pre-Adamite world, which the writer of the Mosaic narrative possessed, have proceeded.

This evidence of the inspiration of Holy Writ is manifestly of a higher order than any which has been supplied by fulfilled prophecy. We can conceive it to be *possible*, that experience of the past, combined with an extensive and correct knowledge of the present, might supply, to a sagacious mind, arguing from analogy, information as to the future, sufficient to account for a successful prophecy. On the principle declared by Solomon, "the thing that hath been, it is that which shall be; and that which is done, is that which shall be done," the Sceptic has resisted the evidence of inspiration which is derived from fulfilled prophecy. The argument is intelligible; though to an unprejudiced mind the principle is wholly inadequate to account for the strange correspondence which is found, in most instances, to exist between the prediction and the fulfilment. But, as respects the history and detail of the past scenes, which occurred before the existence of Man upon the earth, the evidence of which was buried and hidden from the sight of Moses and his contemporaries, who had nothing analogous to suggest the materials on which their reasoning and reflective powers could act, how is it possible to conceive, that without some supernatural communication, he should have produced any, much less a correct, record of the nature and order of the events of the pre-Adamite world?

It has always been a favourite dogma of the

Sceptic, but adopted and justified of late by some who call themselves Christians, that the inspiration of the Prophets and Apostles differs in nothing from that which influenced the mind, and guided the pen, of a Newton, a Milton, or any of the other master intellects of the world—meaning thereby, that all which the Prophets foretold, and all that the Apostles had taught, were the offspring of unaided human intellect, combining and arranging the materials which were supplied by sense and experience; and that thus holy men of old taught, not by the dictation of God's Spirit, but under the guidance of their own unassisted reasoning powers. However plausible may be the arguments which have been advanced in support of this theory when applied to the case of the Prophets and Apostles, they are wholly unmeaning and inapplicable when we come to deal with the inspiration of one who wrote, as Moses did, of things to which he was an utter stranger, and of which, except by a divine communication, he had no more knowledge than he had of the planetary system, the powers of steam, or the marvels of electricity.

If it could be shown that Newton had, without any previous knowledge of even the rudiments of physical astronomy, depicted the Solar system as he has done, and described the laws by which the planets and their satellites are retained in theri respective orbits, their size, and the periods of their revolutions, even though many of these cosmical bodies *had not* been disclosed, at the time, to the

eye of Man, then might we assimilate the inspiration of a Newton to that of Moses, who described a series of worlds he had not seen or known, without any knowledge of even the first principles of that Science, by means of which the philosophers of the present day have been enabled to trace their natures, describe their contents, and arrange their order.

Again, Milton, after having prayed for inward light,

> "To see and tell
> Of things invisible to mortal sight,"

portrayed, in glowing detail, a history of the councils and wars of Satan and his rebel bands—events which he describes as having occurred before the existence of Man on the earth. When the scenes which have been thus depicted are confirmed by evidence that cannot err, and when sense and experience shall prove his record true, we may then compare the inspiration of Milton with the inspiration that guided the pen with which the Mosaic narrative of the order of the pre-Adamite creation was written. They were as different in their natures, and as incomparable with each other, as the wisdom which stretched forth the Heavens and laid the foundations of the Earth, and the wisdom which constructs a ship, or frames a complicated machine.

We thus advance another step in our establish*ment* of the divine authority of the Bible. The

facts developed by the Geologist not only confirm and substantiate the Scripture record, but they constitute the most conclusive and sensible evidence that exists of that direct communication between God and Man which is called divine inspiration. It is evidence that can, as it were, be seen and felt; and of such a nature, that it cannot be diluted by the plausible sophistries of the latitudinarian, so as to elude the believer's grasp. And thus Geology, the Sceptic's chosen weapon of offence, has not only failed him, but it has recoiled—he has leaned on it until it has pierced his hand; and the Bible has again triumphed in the struggle, to which it was committed by those who have always been labouring to turn its best allies, true science and pure philosophy, against it.

It cannot be doubted, therefore, but that this scene of the Creation depicted by Moses emanated directly from the Almighty, and was communicated, through him, for the instruction of the human race; and, strange to say, it has been preserved, when every other written record, sacred and profane, that existed contemporary with, or subsequent to it, for hundreds of years, has been blotted out and swept away by time's destroying hand. These facts alone would have been sufficient to entitle this ancient record to our peculiar consideration and respect; but when they are coupled with the still more important fact, that Geology has proved it to be TRUE, as well as ancient, what can Man conclude, but that what the goodness of the Omni-

scient dictated, the power of the Omnipotent has preserved?

But further, it would be dishonouring to the Most High to conceive it possible that He, who stooped to reveal the hidden things of the past to Man, and who has exerted his power to preserve the revelation through ages which have effaced everything of a similar nature, should have permitted it to be tainted by association with any thing of authority inferior to itself. If He has protected it from destruction, we may rest assured that He has saved it from corruption; and thus the first page of the Scriptures sheds a lustre on every succeeding page, and is a pledge to Man that the Divine Author of the universe is the Author of the Bible in its integrity, from Genesis to the Revelation.

Thus Geology, so long the assumed vantage-ground of the Sceptic, and a stumbling-block to the inquiring believer, has proved the corner-stone and foundation of inspired revelation. It not only establishes the truth of the first page of the Bible, but it furnishes the most direct and sensible evidence of the fact of divine inspiration, and thereby authenticates the whole canon of Scripture. Its importance as an ally, in the contest between truth and falsehood, cannot be exaggerated. How often does the lamp of faith burn dimly to the wisest and best of Christians; and how frequently do they, at such times, require an anchor to stay the wavering mind from drifting into the shoals and

quicksands of uncertainty and doubt—something to satisfy the sinking spirit that God has a special and protective regard for Man in his low estate! and where can the vacillating thoughts find surer rest, than in the knowledge that the very stones beneath our feet testify, not merely to the presence of the Most High in all his works from the beginning, but that, when their contents are collated with the Mosaic narrative, they furnish us with an assurance that He has stooped to communicate his counsels of old to one of ourselves for the instruction of his fellow-creatures? This gives a reality to Revelation, and to us a pledge that the Almighty is with the children of men, not only as a creator and preserver, but as an instructor, a guardian, and a guide. We no longer believe because we have heard with the hearing of our ears, but because we can exclaim, with the Patriarch Job, after a survey of creative intelligence and power, "Now mine eye seeth thee."

We have now journeyed with the Geologist, as a friend and guide, down the stream of time, through the long ages which intervened between "the beginning" and the human era. As we advanced, new scenes and new orders or races of organic life have been presented to us at intervals, which, though long, are distinctly defined; and from the Zoophyte to Adam, the ascent has been in regular order from the lower to the higher forms of animals. Slowly, but impressively, has Time, at the birth of each succeeding race, repeated the

everlasting truth, that God, in the exercise of his creative powers, is essentially progressive. This is the law by which He moves, and by which his operations, in perfecting the work of his hands on our planet, have been regulated. It is the will of Him, with whom "there is no variableness or shadow of turning," declared by and through his works; and Man may calculate with confidence and assurance on its continuance. Time still flows on, and Man is still at the head of the Creation. But will it always be so? The steady progress of the past demonstrates that a change must come, and that such change will not be retrograde, but in advance. It is written as with a pen of iron in the rocks for ever, that progressing time and progressing creation are inseparable, until perfection shall terminate progress, and the finite shall be merged in the infinite.

The creature which is to succeed imperfect Man, will therefore be of a higher order in the scale of created beings. But here philosophy fails us; and Revelation supplies the intelligence, that the coming creature will be the same, in what constitutes personal identity, with some of those of Adam's race which have existed and shall yet exist in this dispensation, but expanded into a being of an order transcendant to any thing merely human that has hitherto trod the earth. Here is true development and transmutation of species, but not by physical law—it is the operating and *quick*ening power of the Holy Spirit. "It doth

not yet appear what we shall be; but we know that, when He shall appear, we shall be like Him." The change will be from the likeness of the first Adam to that of the second Adam—from the natural body to a spiritual body—from the earthly to the heavenly, "when this corruptible shall have put on incorruption, and this mortal shall have put on immortality," through our Lord and Saviour Jesus Christ.

These are the teachings of Revelation—of things beyond the province of reason, and which could not be reached by sense and experience, the ordinary avenues of human knowledge. And yet it is of importance to know, that from the teachings of sense and experience it is that we have derived the assurance of the communication having come from God. The most insignificant and unpretending fossil which we see and handle, when interpreted by the Geologist, vouches, as we have seen, the divine authority of the writer of Genesis, and through it establishes the authenticity of the whole canon of Scripture; and when once we know that we are reading God's direct revelation to man, the information conveyed is as sure and conclusive to the mind as are the clearest sensible and scientific demonstrations. This we owe to the much-slandered science of Geology, which, falling like a ray of light on the first page of the Bible, has disclosed it to be the first step in the ladder of knowledge, by which Man ascends from the dust and ashes of his low estate to the throne of the *Eternal* and the Infinite.

Of the physical relations between the Creator and the created, there is more instruction to be gained from geological studies and research than from the whole of the transactions of the human era. The natural history of the world, associated with man, affords but a narrow and limited view of the divine economy exercised in its construction, and yields us but scanty and imperfect information respecting the origin and order of the creation of the busy scenes of life with which we are surrounded. In the study of its phenomena, we see, as it were, but a small district of a strange country from an eminence, while all beyond, as regards its extent, its form, and its resources, are unknown. Whereas, in our perusals of the more extended history of the pre-Adamite world from the beginning, disclosed by the labours of the Geologist, the entire system is spread before us—we are looking at the whole of the divine economy as on a map, and take in the minutest operations of the Omnipotent, from the formation of the first particle of solid matter upon our globe up to the creation of the creature made in his own image. We know, not merely that our world of light and life was in the counsels of the Great Architect before that the corner-stone thereof was laid; but we know what He, in his wisdom, designed should take place at the different stages of his vast work, and the processes by which He determined beforehand, that all the parts of the great whole should *be fashioned* and adjusted for its successive occupants.

Before Geology was known as a science, such knowledge did not exist. Apart from Revelation, all was clouds and darkness. Misty speculations of the eternity of matter, and an eternal succession of finite beings, were the creed of the Sceptic; and were not to be refuted by any argument of the Religionist founded on principles acknowledged by his antagonist. But with the aid of the Geologist, bringing us back to a beginning of the matter, animate and inanimate, of our planet, the vanity of such infidel dogmas has been exposed; and we have been placed in a position to take, as it were, the framework of our globe to pieces, and to rebuild the mighty fabric from its very foundations. These are investigations worthy of the reason with which the Almighty has endowed and distinguished man from the other creatures which He had made; and which, when pursued with a teachable and submissive spirit, cannot fail to bring them nearer to Himself. Such has been the nature of the occupation in which we have been engaged in these pages; and in our ascent from stage to stage in the mundane structure, we have found the plan committed to Moses to correspond exactly with the divine workmanship. The word of God is thus authenticated by his works; and the great scheme of Revelation, proclaimed to have come from a divine source, proclaims, in its turn, to fallen and imperfect man, redemption and sanctification—a new heaven and a new earth—where—

"Those redeemed of Adam's race
Shall dwell in righteousness and peace."

Who now can lay it to the charge of the Geologist that his investigations and discoveries have a tendency to shake the testimony of Holy Writ, and to unsettle the sure foundations of Bible-inspiration? If our reasoning and conclusions have been correct, his facts teach nothing that is inconsistent with what Scripture has recorded; and the result of his labours (though it may not have been their direct aim) has been only to fill up, without erasure or correction, the outline of the Creation traced by the hand of Moses. Penetrating into the wide and wild ruins of the primeval worlds, his science has reduced their scattered and confused elements to system and order; and with their ancient stones an edifice has been raised, which, denounced by hasty zeal as a Babel of infidelity, has been proved by more patient research to be a pillar of truth, upholding those eternal verities, which are the pledge and assurance to man that he is a creature, not of time merely, but of eternity.

No other science has ever laid open for man's inspection a vein of knowledge so rich and promising as this. Astronomy has always been considered, in the extent and sublimity of the objects of its inquiries, as the foremost in the rank of the physical sciences; but the contemplation of the vast and countless worlds which fill the realms of space, has taught us no truths, and supplied no

instruction, of such transcendant value and importance to the human race, as that which has been collected by the Geologist from materials which are found within the precincts of our own planet. From the one science, we learn the doctrine of a general providence, and that the Almighty Author and Sustainer of the universe is infinite in power and wisdom; and from the other, we know that He is a special providence, who is boundless in goodness and mercy to the creatures He hath made—for goodness and mercy, in their perfection and purity, must be the essential attributes of that Being who ordained and fitted the crust of our globe for the reception of vitality, and then, from time to time, poured out upon it those forms of organic life for which it gradually became suitable, until the platform of mundane existence had become adapted for Man, and Man came forth from his Creator's hand, surrounded with all that was necessary for the supply of his physical wants and enjoyments. Countless as earth's created beings are the evidences of the special presence of the Deity with the creature made in his own image. Few there are, if any, of the items which compose the mineral, vegetable, or animal kingdoms, which are not found ministering to the well-being of the human race, when their structure and qualities, their origin and history, are developed by the natural philosopher. All of them may be shown, by the light of science, to have contributed, directly or indirectly, to the

formation of our earthly abode, and the furnishing of it with the things necessary and convenient for us; and above all, we have been now listening to their voices going forth from the thresholds of their successive creations, proclaiming in unison the crowning evidence of their Creator's immediate presence with the children of men, in the fact established by Geology, that He stooped to communicate his hidden counsels to one of human mould, for the information and instruction of his fellow-men. Therefore, as regards Man and his destinies, the study of the crust of his own planet, its past and present history, are fraught with instruction of more interest and value than could be supplied by the most extensive and accurate knowledge of the many and mighty worlds that fill the heaven's expanse.

Much indeed is due to the Geologist in every way. His researches have admittedly extended the boundaries of human knowledge, and contribute largely to all that is valuable in many of the most important departments of civilised life. The miner, the engineer, the architect, and the agriculturist are indebted to this attractive science for a large proportion of the physical benefits and advantages with which they have supplied their fellow-creatures. From the same source the natural philosopher has learned how the foundations of the earth were laid; and how the vast fabric of Man's abode arose, adorned with life, and reflecting divine power and goodness from every stage of

nighty structure: and to these claims on our ct, may we not now add the more enduring ing, which extends beyond the precincts of an life into the realms of eternity, in that it supplied us with a verification of the Record loses, thereby sealing, with the seal of the iiscient, Man's charter to his everlasting in- ance? Let the votary of this science con- e to prosecute his useful inquiries with that usiasm which has ever characterised the urer in this fascinating field of philosophy. mysterious interest hitherto experienced in discovery and contemplation of its novel and ime truths, will not be diminished by the con- usness that every established fact will supply her of the links which bind together the ord of Nature and the Record of the Bible; if there be truth in our identification of these Records, the Religionist, who ignored or epresented the facts of Geology, and the Geo- st, who scorned and disregarded the testimony Moses, may henceforth meet among the graves the extinct inhabitants of the pre-Adamite lds, and each exclaim, in the language of the iarch of old, "Surely the Lord is in this place, I knew it not."

THE END.

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